COLOR LASER COPIER 500/550

SERVICE MANUAL (for 220/240V)

REVISION 3 FEB. 1993

Canon

FY8-13AO-030

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FEATURES

1. The Color Laser Copier 500/550 makes high quality copies of color originals with accurate reproduction of colors and blacks. It uses digitizing technology for scanning to produce a digital signal to represent the visual image, and reproduces the image using a laser printing method and four separate developing units (three colors plus black).

   Resolution is 400 DPI, and prints can have a range of 256 gradations for each color. The result is crisp reproduction of fine lines, printed characters and symbols, in all kinds of full color originals (including photographs).

   A black developing unit (like that of a black and white copying machine) has been added to the previously used cyan, magenta and yellow units for better reproduction of black areas of color originals. The four developing units are mounted in a rotary fashion so that each unit is brought into contact, in turn, at the same position with the drum.

2. Since the original color images are converted into equivalent digital signals, they can be processed and edited to produce new, modified, color images.

3. Operation is easy with the editor and touch panel display.
   Even a beginner can produce beautiful full color copies just by setting the original in place and pressing the COPY START key. The color tone can be adjusted as required.

   The many functions allow versatile operation. The editor is a standard feature, and the zoom, image modification, and color conversion functions are operated by push-button keys.

   The copying machine can be operated interactively with the push-button controls and the prompts on the liquid crystal touch panel display.

4. An optional projector can be installed to permit making prints on plain (uncoated) paper up to A3/Ledger size of 35mm film, either color transparencies (positive), or black and white negatives.

5. The many basic features include the following:
   - High-sensitivity OPC photosensitive drum and two-component toner-projection development system for clear, stable images.
   - 50% to 400% range of zoom reproduction ratios plus three fixed reduction and three fixed enlargement ratios.
   - Color copy sizes on paper from A3/Ledger to B5/Mini, plus A4/Letter sizes on OHP film.
   - Two paper cassettes, each holding 250 sheets for continuous paper feeding, plus manual feed mechanism for convenient paper supply.

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I. SPECIFICATIONS

A. Type

Main unit	Desk top
Copyboard	Fixed
Scanning light	Tungsten halogen lamp (170W)
Optical system	Fiber optic lens array
Image reading	Photosensor CCD array
Scanner output	8-bit

B. Performance

Types of original		Sheets, books, 3-D objects (2 kg max.)		
Max. size of original		A3/Ledger (11" × 17")		
Max. number of areas for image modification		For framing and blanking: 30 For color conversion: 3 For mirror image: 1		
Reproduction ratio	DIRECT	1 : 1 (±0.9%)		
		115 V	220/240 V	220/240 V
	REDUCTION I	1 : 0.500 (±1.0%)	1 : 0.500 (±1.0%)	1 : 0.500 (±1.0%)
	REDUCTION II	1 : 0.647 (±1.0%)	1 : 0.707 (±1.0%)	1 : 0.707 (±1.0%)
	REDUCTION III	1 : 0.733 (±1.0 %)	–	1 : 0.816 (±1.0%)
	REDUCTION IV	1 : 0.786 (±1.0%)	–	1 : 0.865 (±1.0%)
	ENLARGEMENT I	1 : 1.214 (±1.0%)	1 : 1.414 (±1.0%)	1 : 1.154 (±1.0%)
	ENLARGEMENT II	1 : 1.294 (±1.0%)	1 : 2.000 (±1.0%)	1 : 1.224 (±1.0%)
	ENLARGEMENT III	1 : 2.000 (±1.0%)	1 : 4.000 (±1.0%)	1 : 1.414 (±1.0%)
	ENLARGEMENT IV	1 : 4.000 (±1.0%)	–	1 : 2.000 (±1.0%)
	ENLARGEMENT V	–	–	1 : 4.000 (±1.0%)
	ZOOM	1 : 0.500 ~ 4.000 (±1.0%)		
Horizontal scanning direction		400 DPI		
Vertical scanning direction		400 LPI		
Continuous copying		Up to 99 sheets		
Option		Film projector, Control counter/card unit, I.P.U, Bit map memory PCB* , Film scanner, IC card.		
Automatic return to standard mode		2 min. (adjustable in service mode)		

* Officially, Text Memory Board TM-32C; however, referred to as "bit map memory PCB" throughout the text.

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C. Others

Operating environment	Temperature	15°C ~ 30°C*	
	Relative humidity	10% ~ 80%*	
	Barometric pressure	0.8 ~ 1 atm	
Power supply (voltage ±10%)		Serial numbers	
		CLC 500	CLC 550
	115V 60Hz	CSV xxxxx	NRY xxxxx
	115V 60Hz	—	NRZ xxxxx
	220V 50Hz	DSV xxxxx	PRY xxxxx
	240V 50Hz	ESV xxxxx	QRY xxxxx
	240V 50Hz	FSV xxxxx	RRY xxxxx
	240V 50Hz (FRN)	GSV xxxxx	SRY xxxxx
	220V 50Hz (GER)	HSV xxxxx	TRY xxxxx
	220V 50Hz	KSV xxxxx	URY xxxxx
	220V 50Hz	—	PRZ xxxxx
Power consumption	440 W max. (scanner only)		
Dimensions	Width	760 mm (30")	
	Depth	700 mm (27.6")	
	Height	249.5 mm (9.8")	
Weight		51 kg (112.4 lb.)	

* See Figure 5-1 of the PRINTER SERVICE MANUAL for details.

Information in this manual is subject to change without notice for product improvement.

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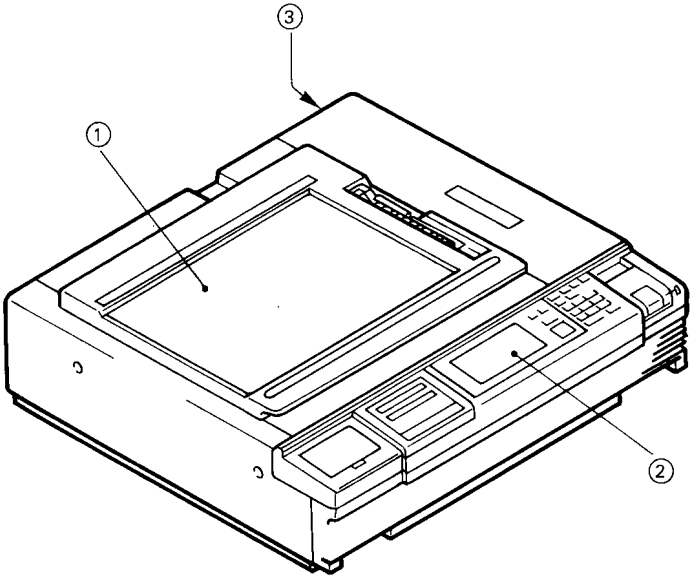
II. NAMES OF PARTS



① Editor
② Control panel
③ Power switch

Figure 1-1 External view

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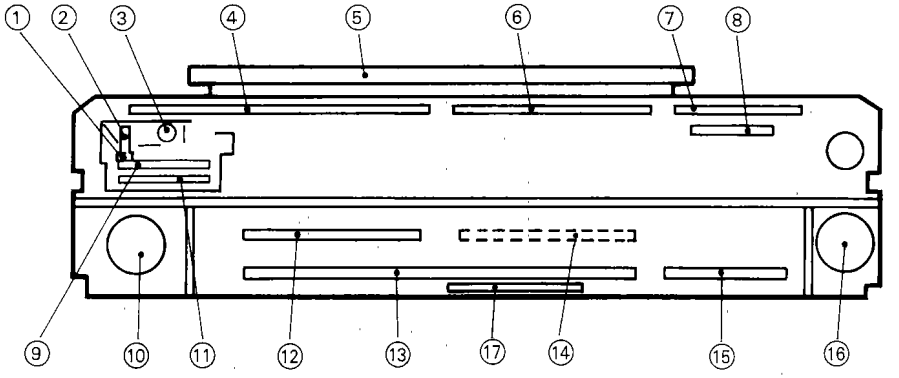
III. CROSS SECTION



① CCD
② Fiber optic lens array
③ Scanning lamp
④ Control panel PCB
⑤ Editor
⑥ LCD (liquid crystal display)
⑦ Control panel PCB
⑧ LCD power supply PCB
⑨ CCD driver PCB
⑩ Fan motor
⑪ CCD preamplifier PCB
⑫ CPU PCB
⑬ Digital processor PCB
⑭ Bit map memory PCB (option)
⑮ Analog processor PCB
⑯ Scanner motor
⑰ ECO processor PCB

Figure 1-2 Cross section

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I. BASIC OPERATION

A. Functional Construction

The image scanner can be divided into three major systems: exposure, control, and image processing systems.

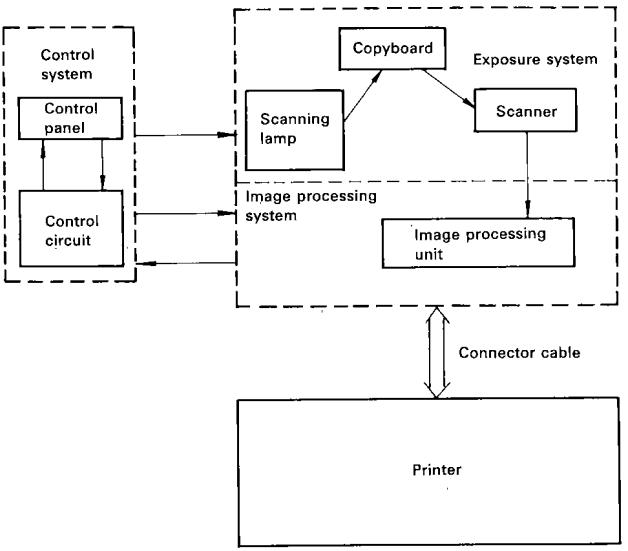

Figure 2-1

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B. Electrical Circuit

Electrical components are controlled mainly by the microprocessor on the CPU PCB and the microprocessor on the scanner motor control PCB.

The microprocessor on the CPU PCB mainly controls image processing in the digital processor, while the microprocessor on the scanner motor driver PCB mainly controls the scanner motor.

Each small area of the optical image (light) reflected from the document is converted by the CCD to an equivalent electronic (analog) voltage, amplified by the CCD preamplifier PCB, and then converted to equivalent digital data by the A/D converter of the analog processor PCB. Image processing is performed by the digital processor PCB, and the result is transmitted to the printer as an 8-bit video signal.

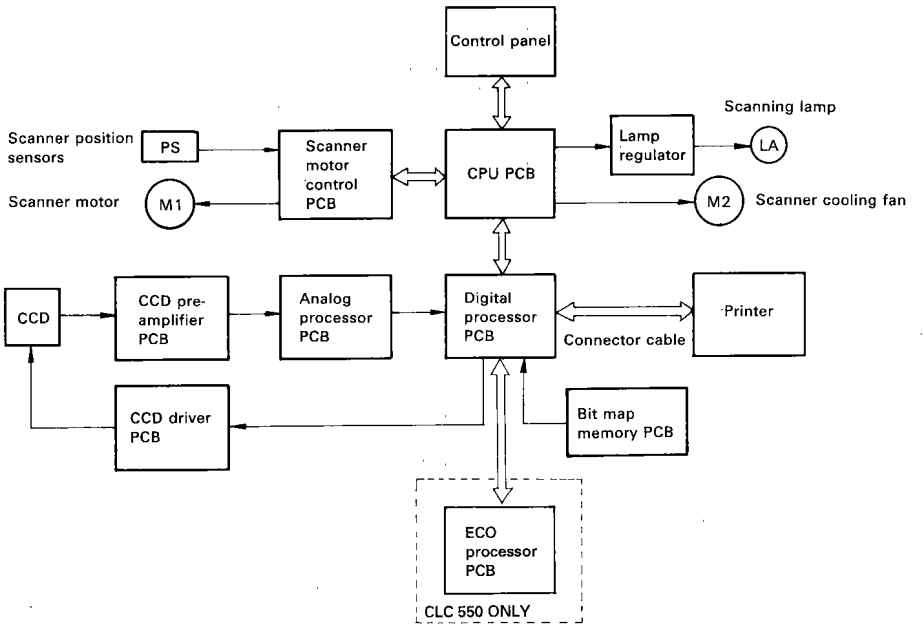

Figure 2-2

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C. Input/Output to and from the Main PCBs

1. CPU PCB Input/Output

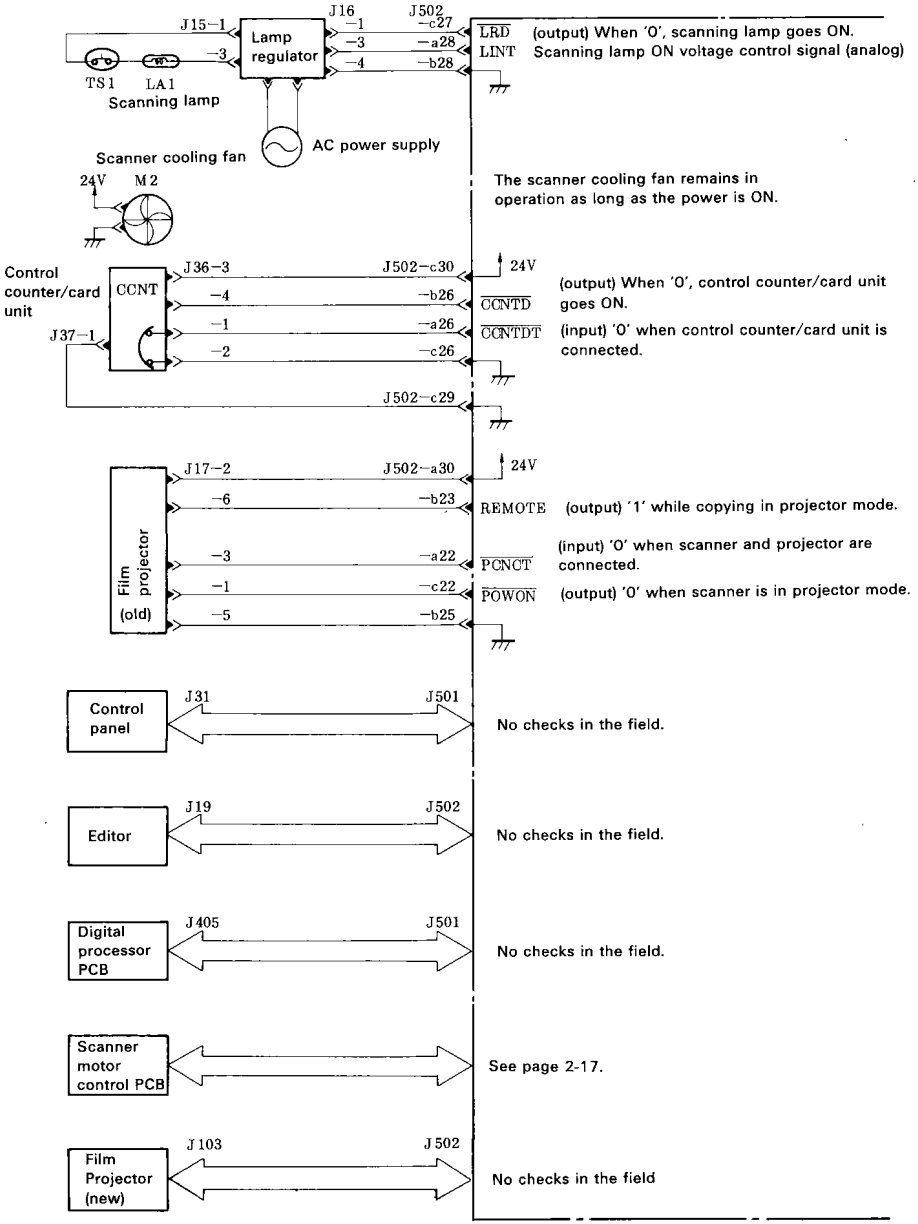

Figure 2-3

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2. Scanner Motor Control PCB Input/Output

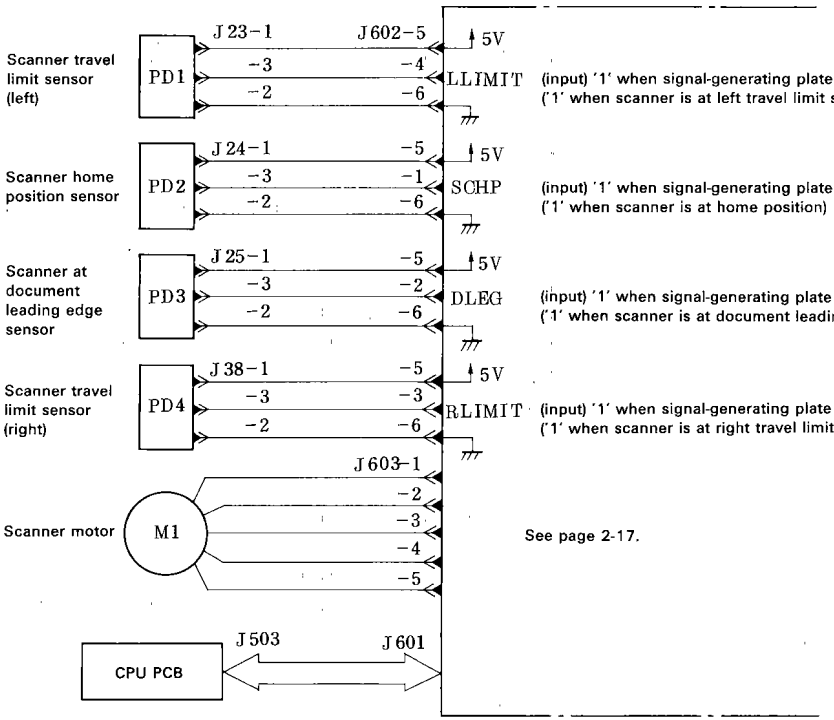

Figure 2-4

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D. Basic Operation Sequence

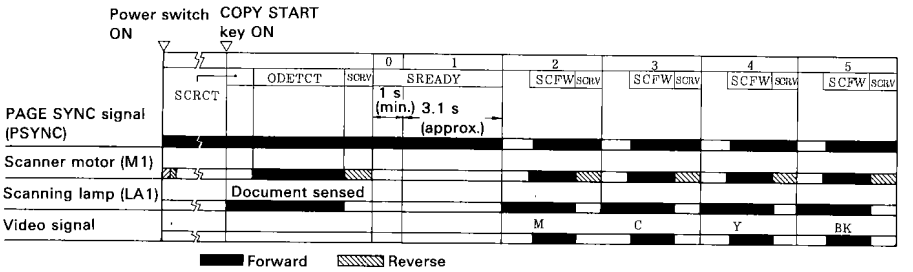

Figure 2-5 A4/Letter, full color, 1 copy, document sensor ON

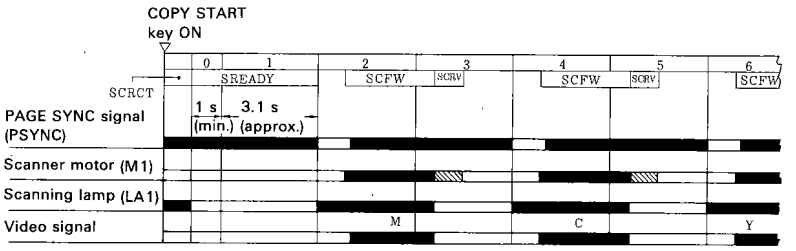

Figure 2-6 A3/Ledger, full color, 1 copy, document sensor OFF

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Period		Operation	Remarks
SCRCT (Shading compensation)	Period in which scanner moves forward and backward for shading compensation measurement.	The scanner measures the density of the white plate for use in shading compensation.	
ODETCT (Document position sensing)	When document position sensing function has been selected; ODETCT is the initial period when scanner is moving forward. (Preparatory scan)	The document is illuminated by scanning lamp and the scanner moves forward 432 mm (170 in.) (vertical scanning direction) to determine the positions of the boundaries of the document.	• If document position sensing mode is not selected, this scanning operation is not performed.
SREADY (Scanner ready)	Period before printer starts PRTR rotation.	The scanner waits until the printer picks up paper and becomes ready.	
SCFW (Scanner forward)	Period when scanner moves forward to scan the document.	The document is illuminated by the scanning lamp and the reflected optical image is projected onto the CCD.	
SCRV (Scanner reverse)	Period when scanner reverses.	The scanner returns to the home position.	

Table 2-1

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E. Interface Signals

Figure 2-7 shows the interface signals used for communication between the scanner and printer.

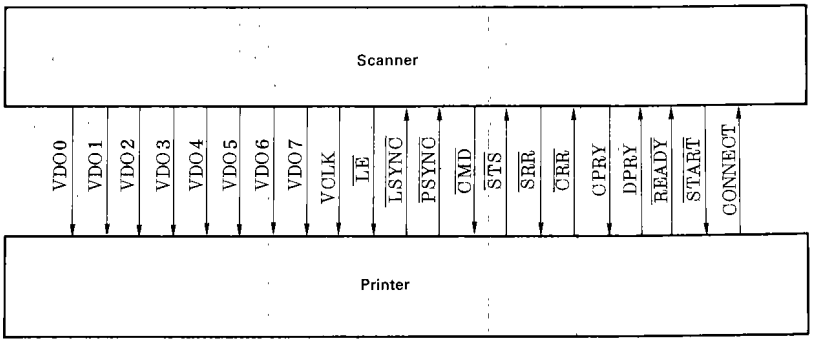

Figure 2-7

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Notation	Signal	Description
VDO 7 – 0	VIDEO	Refers to the video (image) signal from the scanner.
VCLK	VIDEO CLOCK	Is used by the scanner in sending the video (image) signal; the video signal is synchronized with the signal.
$\overline{\text{LE}}$	LINE ENABLE	Is used by the scanner in sending the video (image) signal; it indicates that the Video signal is enabled.
$\overline{\text{LSYNC}}$	LINE SYNC	Is the horizontal sync signal generated by the printer based on BD.
$\overline{\text{PSYNC}}$	PAGE SYNC	Is a sync signal for printing colors (Y, M, C, BK).
$\overline{\text{CMD}}$	COMMAND	Is a command signal sent from the scanner to the printer.
$\overline{\text{STS}}$	STATUS	Is a printer status signal generated by the printer in response to CMD.
$\overline{\text{SRR}}$	STATUS RECEIVE READY	'0' when the scanner is ready to receive STS.
$\overline{\text{CRR}}$	COMMAND RECEIVE READY	'0' when the printer is ready to receive CMD.
CPRY	SCANNER POWER READY	'1' when the microprocessor of the scanner has completed initial resetting and is ready to communicate with the printer.
DPRY	PRINTER POWER READY	'1' when the microprocessor of the printer has completed initial resetting and is ready to communicate with the scanner.
$\overline{\text{READY}}$	READY	'0' when all print ready conditions are satisfied in the printer.
$\overline{\text{START}}$	START	'0' when the scanner instructs the printer to start printing.
CONNECT	CONNECT	Indicates that the scanner and printer are connected.

Table 2-2

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F. Horizontal/Vertical Synchronization

1. Horizontal Synchronization

For the scanner to send VIDEO signals of a single scan to the printer, it needs the LINE SYNC signal (LSYNC), which is generated as described below. The DC controller PCB generates the BEAM DETECT signal (BD) based on the laser beam reflected by the BD mirror of the printer. The BEAM DETECT signal in turn is used by the DC controller PCB to generate the LINE SYNC signal. With the LINE SYNC signal, the digital processor PCB in the scanner generates the LINE ENABLE signal (LE) by synchronizing it with the CLOCK signal and sends VIDEO signal (VIDO0 through VDO7) to the printer synchronized with VCLK.

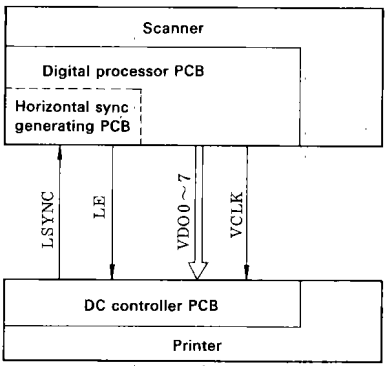

Figure 2-8

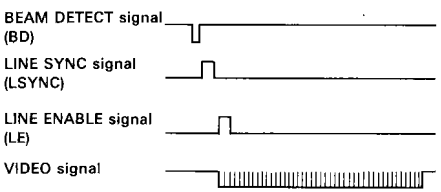

Figure 2-9

2. Vertical Synchronization

For the scanner to send VIDEO signals (VDO0 through VDO7) to the printer, it needs to do so at correct timing; and the printer generates the PAGE SYNC signal (PSYNC) for the purpose. The scanner, in response to the PAGE SYNC signal, turns the scanning lamp ON, moves the scanner according to instructions from the control panel, and sends VIDEO signals to the printer.

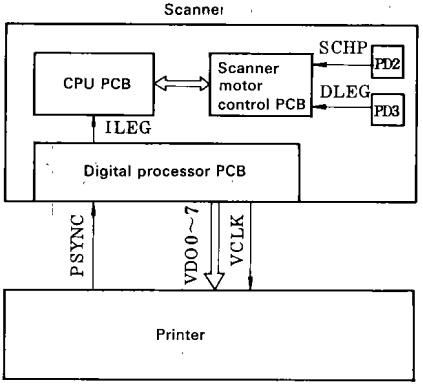

Figure 2-10

If the image is to remain still in the sub scanning direction, the leading edge of the image on the copy paper corresponds to the rising edge of the DOCUMENT AT LEADING EDGE signal (DLEG).

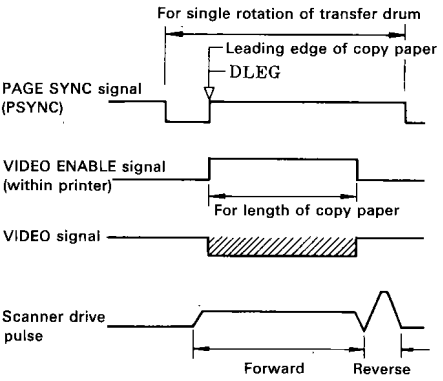

Figure 2-11

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To move the image to the rear (of paper) in the sub scanning direction, the travel is calculated into a period of time by the CPU PCB, and the scanner is started with a delay.

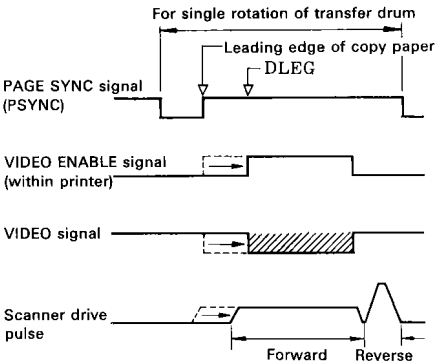

Figure 2-12

To move the image to the front (of paper) in the sub scanning direction, the scanner is moved forward and kept still before it scans the document. Upon generation of the signal, the scanner starts to move and read the VIDEO signals.

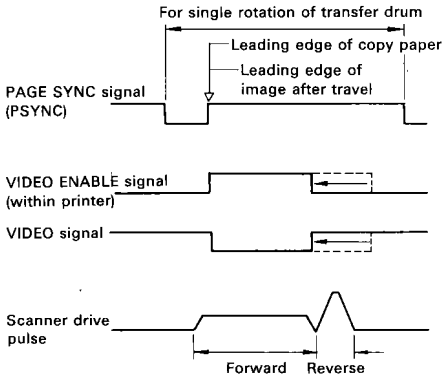

Figure 2-13

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II. EXPOSURE SYSTEM

A. Change of Reproduction Ratio

The reproduction ratio is changed in the horizontal scanning direction (parallel to the drum shaft) by skipping the signals for some CCD photocells (pixels) when the image signals are being written into the line memory for REDUCTION, or by repeatedly reading when they are being read out of the line memory for ENLARGEMENT.

The reproduction ratio in the vertical scan direction is changed by increasing (REDUCTION) or decreasing (ENLARGEMENT) the scanner speed.

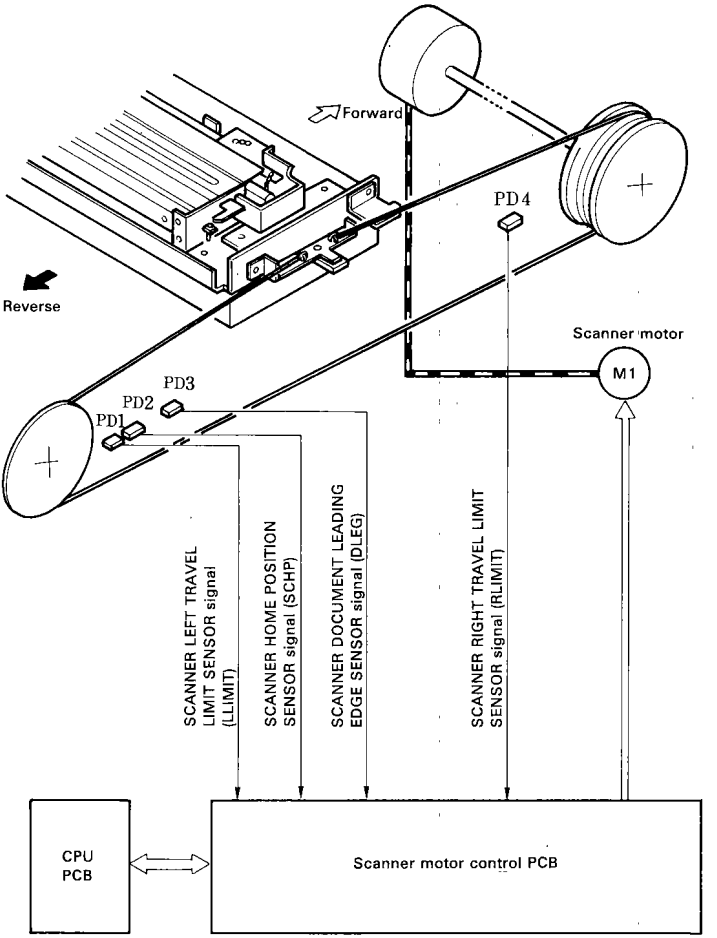

Figure 2-14

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B. Scanner Drive System

1. Outline

The circuit shown in Figure 2-14 controls the scanner motor. Its main functions are:

1 Setting the direction of rotation
2 Controlling motor speed

The direction of the motor changes to move the scanner forward and backward. The speed for moving the scanner forward is set to suit the reproduction ratio. The reverse speed is constant, independent of the reproduction ratio, and is four times the speed for DIRECT copying.

The scanner drive motor is a five-phase stepping motor.

Speed and direction are determined by the timing and polarity of drive pulses.

2. Relationship of Photosensors and Signals

Photo sensor	Signal name	Scanner		Purpose
		Moving forward	Moving in reverse	
PD1	LLIMIT		⌐	To stop scanner if its travel exceeds reverse limit
PD2	SCHP			Scanner home positon
			⌐	To stop scanner within approximately 7 mm
PD3	DLEG	⌐		Video signal initiation when there is no image shift
PD4	RLIMIT	⌐		To stop scanner if its travel exceeds forward limit

Table 2-3

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3. Scanner Basic Operations

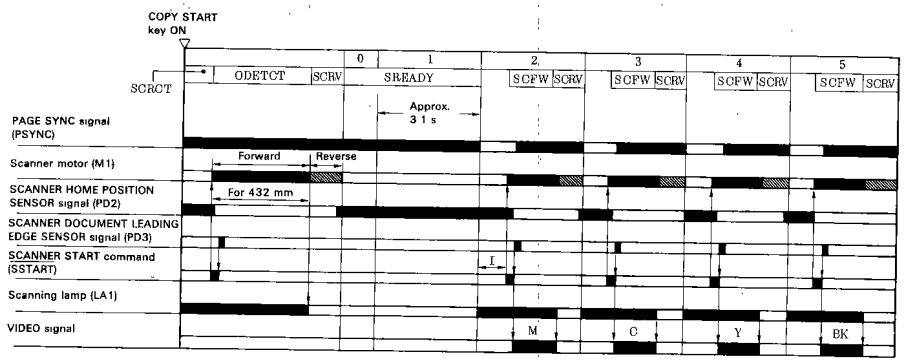

Figure 2-15 A4/Letter, full color, 1 copy, DIRECT, document sensing ON

I: This time varies with the reproduction ratio set via the control panel and with the extent of image shift.

4. Scanner Operations for Forward Vertical Image Shift

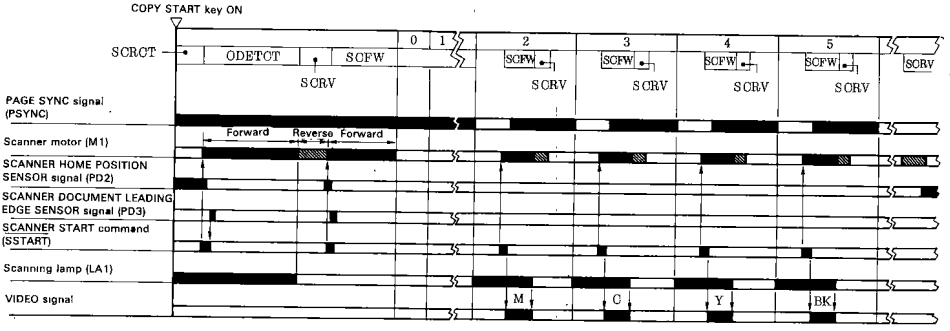

Figure 2-16 A4/Letter, full color, 1 copy, DIRECT, document sensing ON, area specification framing, image shift (forward)

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Note:
The sequence of operations in Figure 2-16 produces changes of the type shown in Figure 2-17. An area has been specified and moved to the left side of the document and the rest of the original document has been made blank then the finished product is printed on A4-size paper.

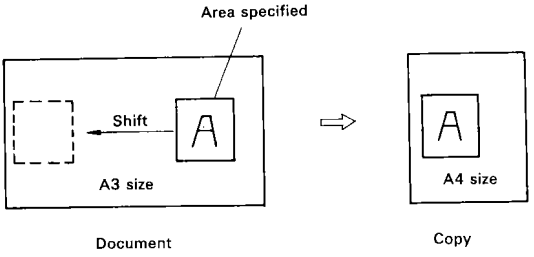

Figure 2-17

After the document position sensing operation has been completed, the scanner moves to the position corresponding to the image position before scanning the image, and scans the document using this position as the reference.

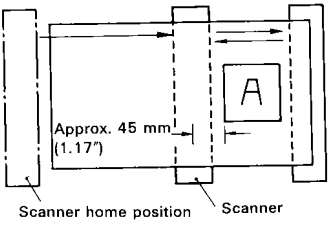

Figure 2-18

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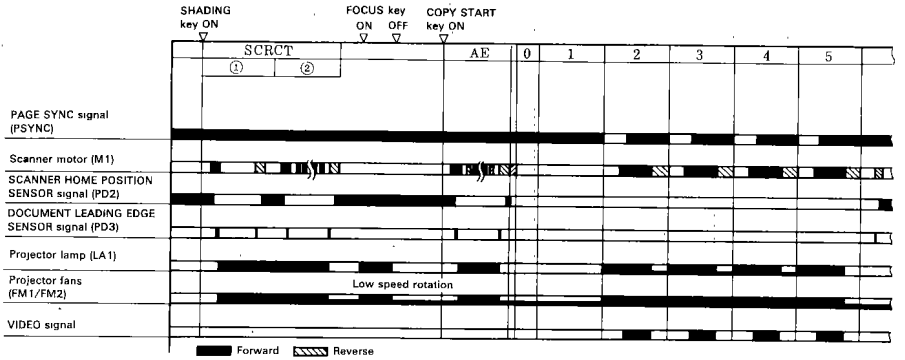
5. Scanner Operation When the Projector Is in Use



1 Adjustment of the white level between channels
2 Measurement of the shading compensation value

Figure 2-19 Full color, 1 copy, fixed reproduction ratio, projector mode

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6. Scanner Motor Control

a. Outline

The microprocessor on the scanner motor control PCB communicates with the CPU on the CPU PCB in serial.

The microprocessor of the scanner motor control PCB (IC603) receives such instructions (serial signals) as scan distance, reproduction ratio, and direction of movement from the CPU on the CPU PCB (IC515) via the TXD line.

IC603 receives commands and sends back a status signal to IC515 via the RXD line.

When the SCANNER START command (SSTART) from IC515 becomes '0', the scanner motor control PCB outputs drive pulses to the scanner motor field windings to drive it at the speed appropriate to the requirements (reproduction ratio, etc.).

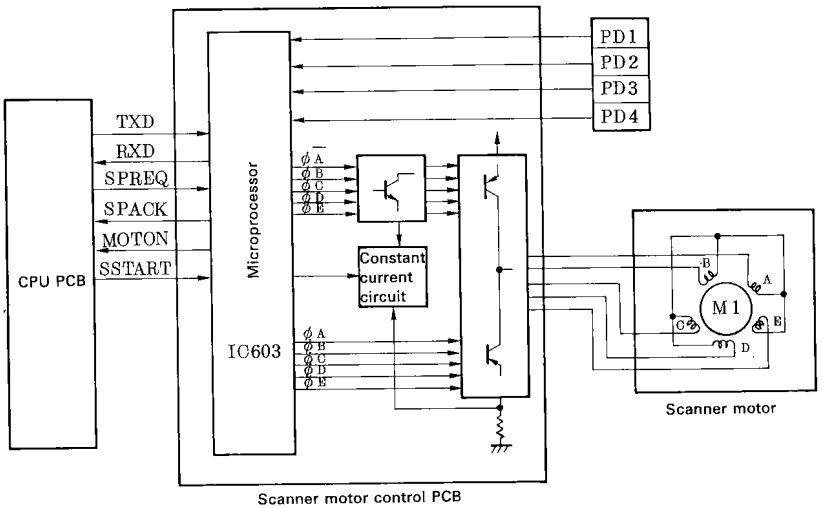

Figure 2-20

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b. Forward Rotation

When the drive (voltage) pulses are applied sequentially from phase A to phase E windings, as shown in Figure 2-21, the motor rotates forward.

Motor speed is proportional to pulse frequency.

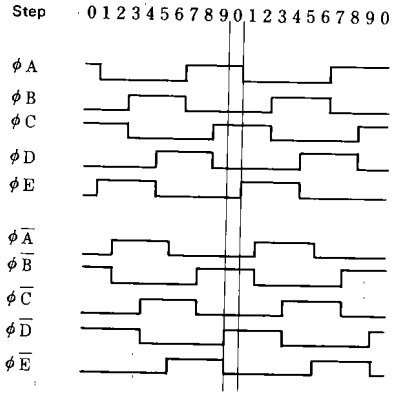

Figure 2-21 Drive pulses for DIRECT copying (forward)

For REDUCTION copying, the motor should be driven faster by increasing the pulse frequency. This is shown in Figure 2-22.

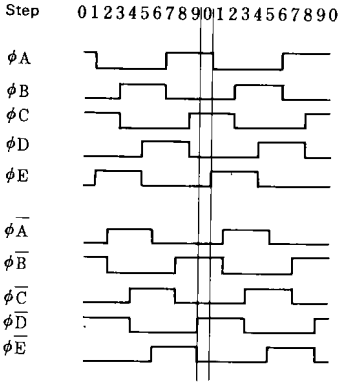

Figure 2-22 Drive pulses for REDUCTION copying (forward)

c. Reverse Rotation

To reverse the motor, drive pulses are output to the windings in the reverse of the order for forward drive. (See Figure 2-23.)

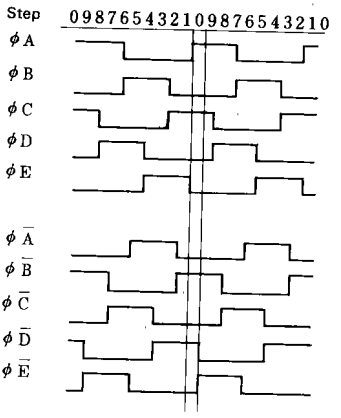

Figure 2-23 Drive pulses for reverse

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C. Scanning Lamp

1. Scanning Lamp Control (ON and OFF)

When $\overline{LRD}$ = 1, the output of the lamp regulator goes '0'; the condition deprives the scanning lamp (LA1) of its power and, as a result, the lamp goes OFF. When $\overline{LRD}$ = 0, the output of the lamp regulator goes '1'; the condition supplies the scanning lamp (LA1) with power and, as a result, the lamp goes ON.

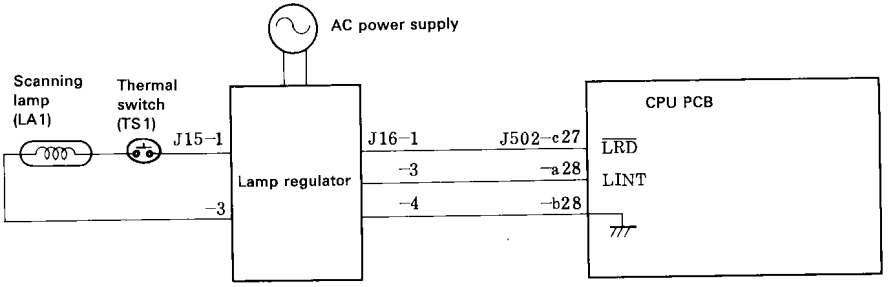

Figure 2-24

2. Scanning Lamp Control (intensity)

The intensity of the scanning lamp is adjusted by controlling the supply voltage sent by the lamp regulator to the scanning lamp according to the level of LINT from the CPU PCB. LINT varies between 3 V and 4.7 V and is controlled so that the supply voltage to the scanning lamp is varied between about 60 VDC and 70 VDC (output terminal level of the lamp regulator).

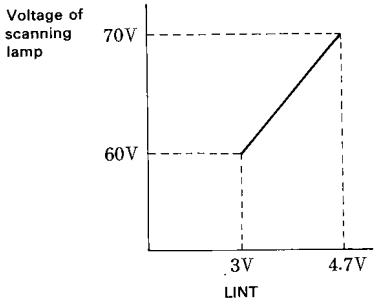

Figure 2-25

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III. IMAGE PROCESSING SYSTEM

A. Overview

Figure 2-27 is a block diagram of the major functions of the image scanner unit.

The document is illuminated by the scanning lamp, a narrow strip of optical image of the document is focussed onto a linear array of very small photosensitive elements (a charge coupled device, or CCD), each of which generates an electrical signal representing the intensity of light at that location. The array has color separation filters which allow the CCD to generate a signal indicating the color at each point along the array.

This electrical signal is processed as required by the image processing unit (editing), and transmitted to the printer unit by cable.

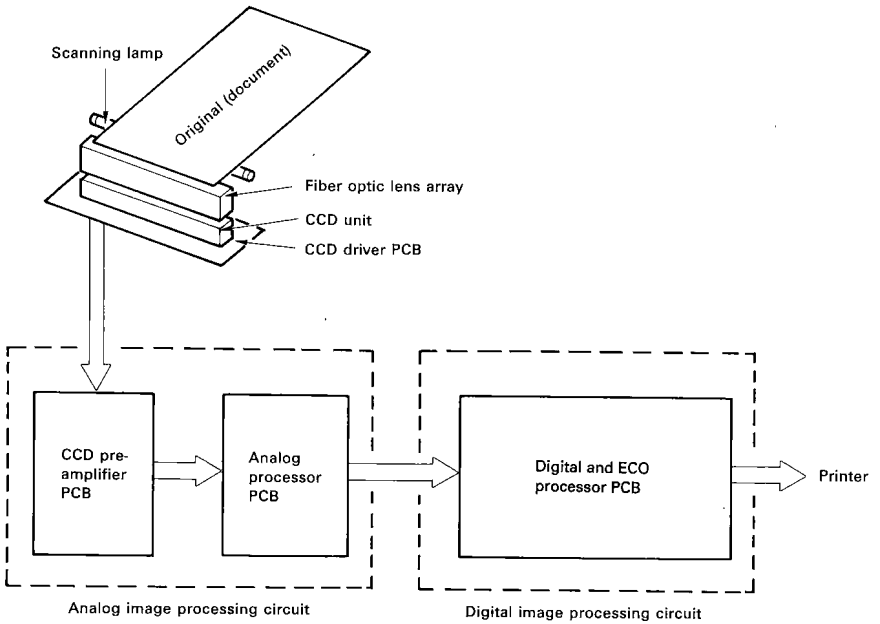

Figure 2-27

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B. CCD and CCD Driver

1. General

The charge-coupled device (CCD) used in the Laser Color Copier has five strips of about 14,000 photocells each, positioned end to end. Each cell has a blue, green, or red filter in the light path, the filters repeating regularly: B, G, R, B, G, R..... Each photocell generates the signal for one pixel (picutre element) and three photocells (B,G,R) generate the color information for one small area. This is equivalent to about 4,700 BGR sensing units, so the resolution on paper up to 297 mm (11.6 inches) wide is 400 DPI.

The CCD used in the scanner consists of five discrete CCD chips having 2,800 photo cells and is capable of generating five channels of video signals at the same time.

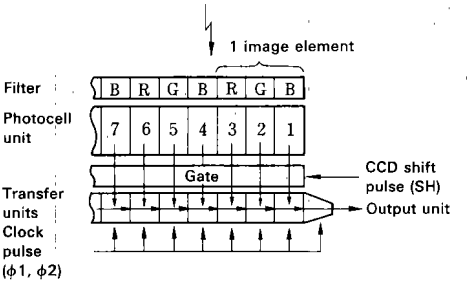

Figure 2-29

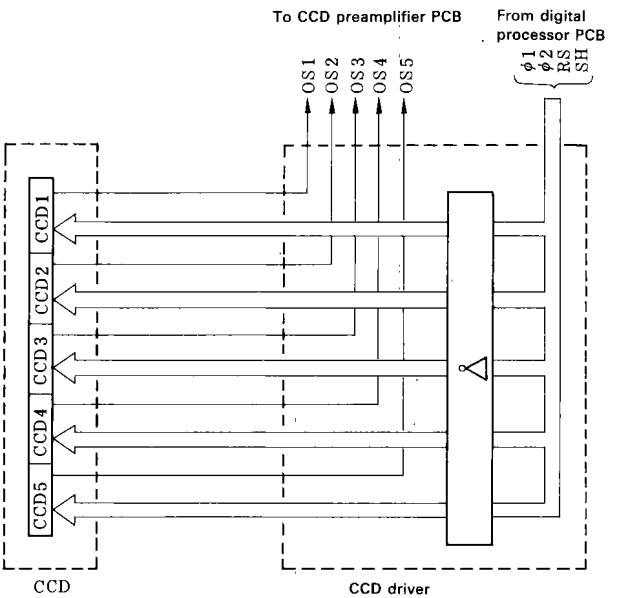

Figure 2-28

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2. CCD Photocell Unit

Each photocell of the CCD is 20 × 63.5 μm, and is connected to its own capacitor and switch, as represented by Figure 2-30. For each cycle, the capacitor (C1) begins with zero charge. When light strikes the photocell (photodiode PD), electrons are removed from the top plate of C1, thus putting a (+) charge on the top plate. The charge Q is proportional to the intensity of the light (L) striking PD.

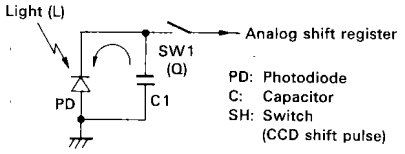

Figure 2-30

3. CCD Analog Shift Register (transfer unit)

At the end of the cycle, switch SH is closed and the charge (Q) on C1 is transferred by the analog shift register (ASR) to the output unit.

The charge of the capacitor of every photocell unit is transferred to the ASR simultaneously, then the charges are transferred sequentially by the ASR.

Each is output in turn (serial signal) by the output unit.

4. CCD Output Unit

Each charge is transferred in turn by the ASR to the capacitor (C2) of the output unit. The charge is converted to an equivalent voltage by the source-follower FET of the output unit and output as a serial signal. Afterward, SW2 opens and RS closes momentarily to reset C2 for the next cycle.

Operation of switches SW1 and SW2, and shifting of charges by the ASR, are in response to timing signals $\phi 1$ and $\phi 2$.

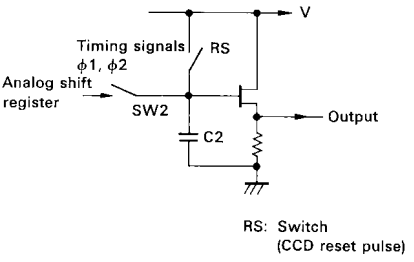

Figure 2-31

Figure 2-32 shows the timing chart for clock pulses 1 and 2, reset pulse RS, and the CCD output.

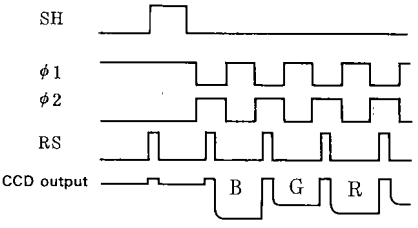

Figure 2-32

Each of the pulses $\phi 1$, $\phi 2$, RS, and SH is input from the digital processor PCB. The CCD reads one line at a time, in response to shift pulse SH. SH is synchronized with the line sync signal (LSYNC).

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C. Analog Image Processing Circuit

This circuit consists of the CCD preamplifier PCB and the analog processor PCB, and performs various analog processing on the output from the CCD unit.

a. CCD preamplifier PCB

The CCD preamplifier circuit has two functions.

- Eliminating DC component
- Amplification

The output from the CCD is a fluctuating DC signal. The AC component of signals OS1 through OS5 (Figure 2-33) is passed by the coupling capacitors and amplified to a constant level.

b. Analog processor PCB

The analog processor circuit has two functions.

- Equalizing BGR photocell outputs
- A/D conversion

The five sets of video signals input to the analog processor PCB are first equalized.

The signals from the photocells for B, G and R are brought to the same base level to compensate for inherent differences in analog signal output from the photocells for each color.

The base level (multiplication factor) for each of the three colors in each of the five CCD systems can be adjusted individually.

The video signals in the five channels are held on the sample signals (B S/H, G S/H, R S/H) generated by the digital processor PCB and separated into 15 channels (BGR).

The video signals of these 15 channels are then amplified separately to correct the BGR levels; thereafter, the 15 channels of video signals are synthesized back to five channels according to the select signals (B SEL, G SEL, R SEL) generated by the digital processor PCB.

The five video signals input to the A/D converter are individually converted into 8-bit digital signals and output to the digital processor PCB.

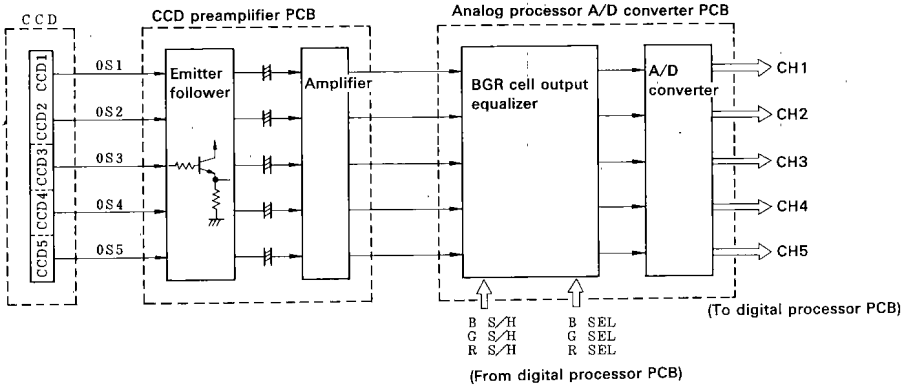

Figure 2-33

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D. Digital Image Processing Circuit

1. Outline

Figure 2-34 shows the construction of the circuit. The VIDEO signal from the analog image processing circuit is made to go through BGR → YMC conversion in the digital image processing circuit. At the same time, each of the data conversion processes is performed as instructed by the control panel. The video data after conversion are then sent to the printer in the form of 8-bit VIDEO signals.

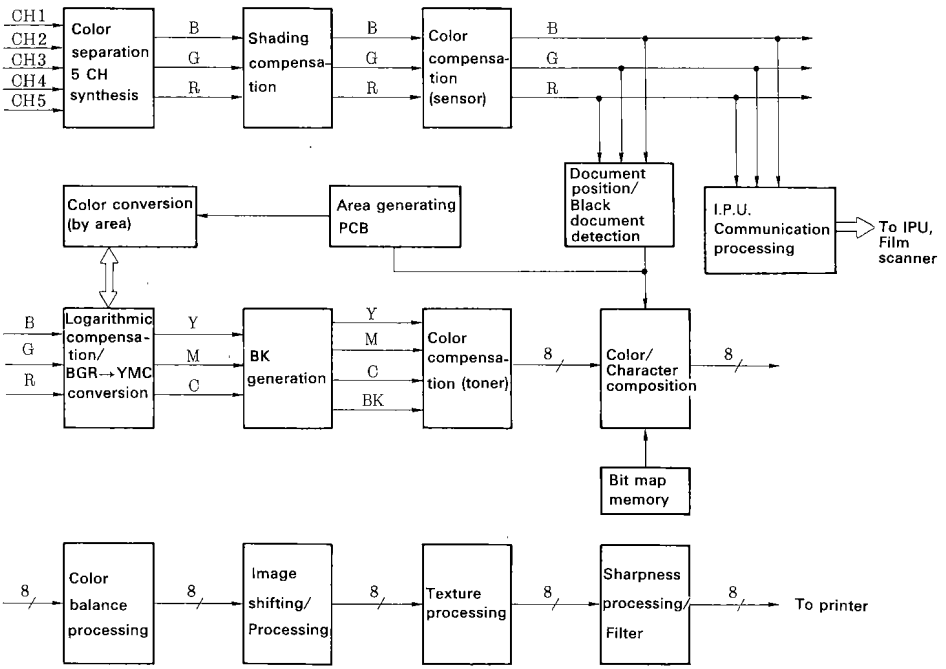

Figure 2-34

2. Color Separation/5 CH Synthesis

The video data of the five channels (density data for B, G, R) from the analog process PCB are put into the color separation/5 CH synthesis circuit. These video data of the five channels are sorted into B, G, and R and output as video signals of three channels.

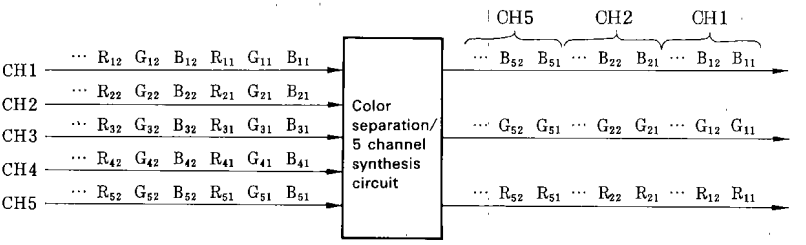

Figure 2-35 Color separation/5 channel synthesis

3. Shading Compensation

The output of the CCD is not always uniform even the document may be uniform in density and reflects light as such. The fact is attributed to the following:

a. The pixels of the CCD have differing sensitivity.
b. The lenses arranged in an array have differing transmission characteristics.
c. The intensity of the scanning lamp differs between its center and ends.
d. The scanning lamp is subject to deterioration.

To make up for the deviations, shading compensation is performed; the scanning lamp is turned ON to expose the standard white plate.

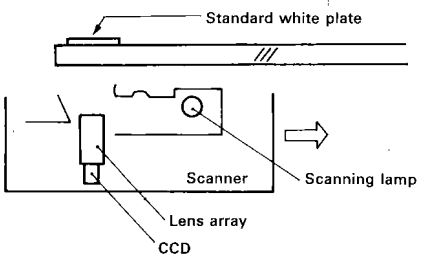

Figure 2-36

The CCD measures the light reflected by the standard white plate and outputs data (measurements). The shading compensation PCB compares the data and the target value* and stores the difference as the shading compensation value in memory.

* The target value is variable in the service mode (DOCB-LEV).

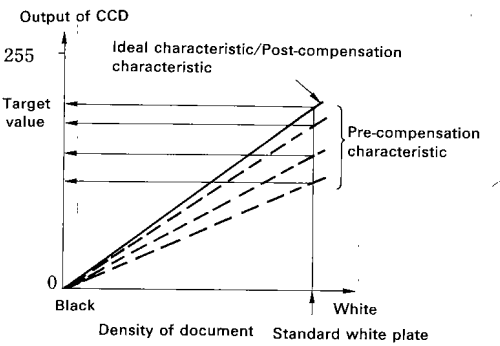

Figure 2-37 Shading compensation

The shading compensation value is used to correct the data obtained by scanning the document so that the data will be uniform. The measurement for the value is taken each time the COPY START key is pressed.

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4. Color Compensation (sensor)

The color compensation circuit is used to correct the transmission characteristics of the B, G, and R filters in the CCD.

An "ideal" filter is one that lets light of a certain wave length pass through it and blocks light of all other wave lengths. Such a filter, however, is not available in practice, and the circuit is used to sort out the light.

The mechanism of the circuit is explained below using the G filter. Ideally, the G filter should pass light of 500 nm to 600 nm in wave length (green) and blocks light of 500 nm or less or 600 nm or move in wave length. In practice, however, the filter passes light falling under a and c of Figure 2-38, and it blocks light under b of the same figure.

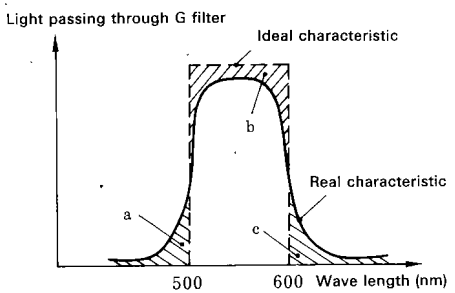

Figure 2-38

To correct the difference and bring about the ideal characteristic, the following computation is performed.

$$\begin{bmatrix} R\ out \\ G\ out \\ B\ out \end{bmatrix} = \begin{pmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{pmatrix} \begin{pmatrix} R \\ G \\ B \end{pmatrix}$$

- R, G, B: Input signal to color compensation circuit
- R out, G out, B out: Output signal from color compensation circuit
- $a_{11} \sim a_{33}$: Coefficient of compensation

5. Color Conversion by Area

a. Gradation Conversion

In gradation conversion, an area is designated on a document and the color specified is changed to a different color but with the gradation of the color before conversion.

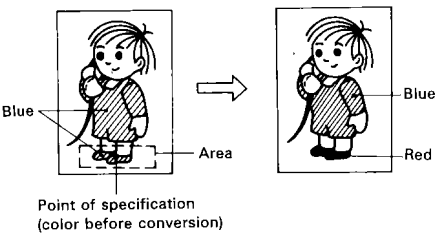

Figure 2-39 Gradation conversion of specified color within designated area

The color to change is specified on the editor with reference to its location. The scanner moves to the position of the color so specified and senses the color by way of color separation. The color after conversion may be point-designated, standard, or registered.

- Point-designated color: Color of the area specified by the editor.
- Standard color: Blue, green, red, yellow, magenta, cyan, black, others.
- Registered color: Color specified in advance by means of the color sensing mechanism.

The degree of gradation may be varied as desired.

b. Conversion of Designated Color

In conversion of designated color, an area is specified on a document, and that color only is changed to a different color.

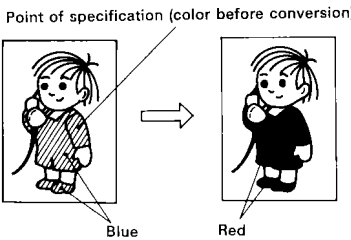

Figure 2-40 Conversion of designated color

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6. Document Recognition

Document recognition is the process of sensing the size and position of the document on the copyboard glass.

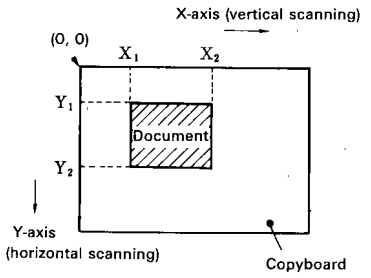

Figure 2-41

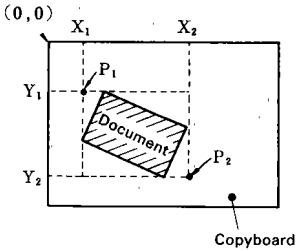

Figure 2-42

Figure 2-41 shows a rectangular document with the X-axis parallel to the vertical scanning and the Y-axis parallel to the horizontal scanning, while Figure 2-42 shows an original placed at an angle to the axes.

Unlike the copyboard covers of most copying machines, the bottom surface of the cover of the Laser Color Copier has a mirror finish (not white); this prevents diffused reflection of light from the scanning lamp to the CCD.

The only light reaching the CCD is reflected from the area of the copyboard glass covered by the document.

- Reflection from copyboard cover in areas of copyboard glass not covered by the original

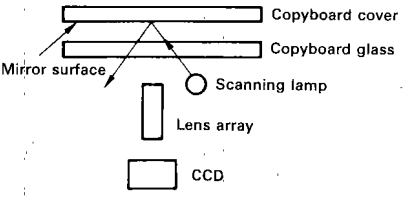

Figure 2-43

- Reflection from document on copyboard glass (omnidirectional)

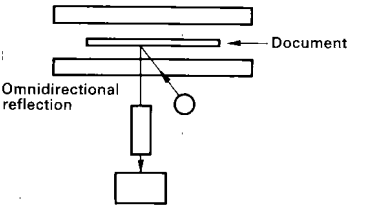

Figure 2-44

Documents are generally on white paper, so any area on the copyboard glass that reflects as white during a measurement scan by the scanning lamp and CCD is regarded as a document.

In principle, the area of the rectangle with the diagonal from coordinates (Xmin, Ymin) to (Xmax, Ymax) is regarded as the area of the document.

However, if the document is placed at an angle to the axes, as in Figure 2-42, the measuring system identifies the rectangle with the diagonal from P1 to P2 as the document.

Reference:

1. Xmin Coordinate of first position in the vertical scanning direction at which change from black to white is detected.
2. Xmax Coordinate of last position in the vertical scanning direction at which change from white to black is detected.
3. Ymin Coordinate in the horizontal scanning direction of the first change from black to white.
4. Ymax Coordinate in the horizontal scanning direction of the last change from white to black.

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Automatic recognition of the size and position of the original also enables automatic selection of reproduction ratio, automatic paper selection, and image shift.

7. Black Document Recognition (ACS)

Black document recognition is performed to determine whether the document placed on the copyboard is a black document or color document. Black document recognition is performed when the document is scanned and, once the document is recognized as a black document, mono color (black) copy operation is performed.

When a black document is separated for color, its color components are in the ratio of equal values. Separation of a color document, however, results in a different ratio reflecting the color composition of the document.

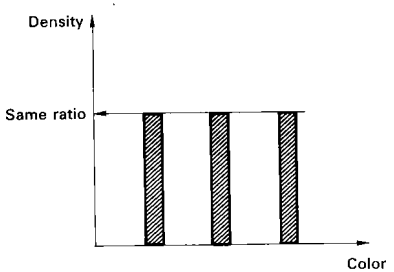

Figure 2-45 Black document

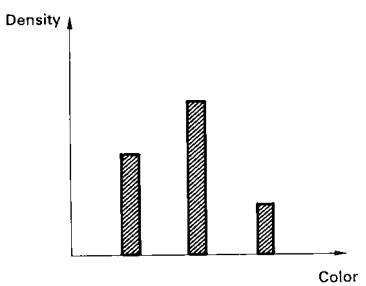

Figure 2-46 Color document

When a document is separated for color and if the ratio of B, G, and R is of equal values, the document is recognized as a black document and the resulting copies will be mono color (black) copies.

8. Logarithmic Compensation/ BGR → YMC Conversion

a. Logarithmic Compensation

The density of a document noted by the eye (Y, M, C) and the output of the CCD (B, G, R) generated based on the light reflected by the document are not proportional. Level conversion, as shown in Figure 2-47, is performed to compensate for the difference.

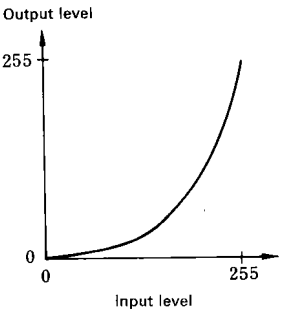

Figure 2-47 Logarithmic compensation

Figure 2-48 shows the relationship between light (BGR) and document density.

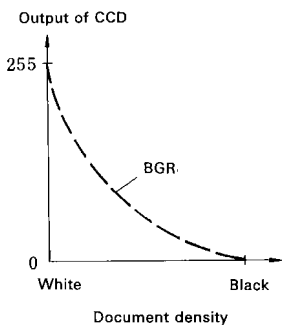

Figure 2-48

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b. BGR → YMC Conversion

In this conversion, Y, M, and C signals are generated taking advantage of the fact that B, G, and R (light) and Y, M, and C (toner) are in a complementary relationship.

Light \ Toner	Y	M	C
B	Absorbed	Reflected	Reflected
G	Reflected	Absorbed	Reflected
R	Reflected	Reflected	Absorbed

Table 2-4

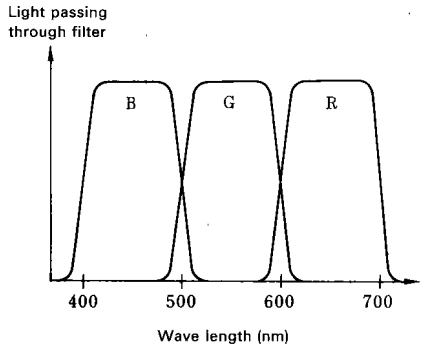

Figure 2-49

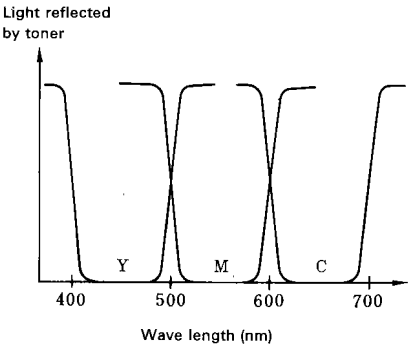

Figure 2-50

The light transmitted by each of the filters of the CCD (B, G, R) and the document densities (Y, M, C) are complementary to each other; as such, level conversion is performed as in Figure 2-51, and Y, M, and C signals are generated.

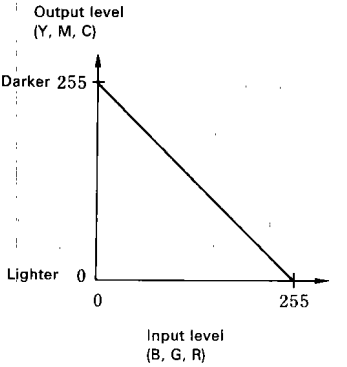

Figure 2-51 BGR → YMC Conversion

Note:
$Y = \overline{B}$, $M = \overline{G}$, $C = \overline{R}$

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9. Generation of BK

Based on the toner density signals (Y, M, C), the BK (black) toner density signal is generated. In general, black can be reproduced by mixing each toner (Y, M, C) in equal amounts; to enhance the reproduction, the printer uses black toner in addition to toners for Y, M, and C. The minimum value (Min) is obtained for each pixel and for each component (Y, M, C) and multiplied by the compensation coefficient (ß); the product (ßMin) for Y, M, and C are then used as the BK component of the pixel in question.

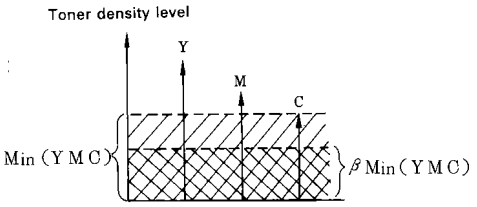

Figure 2-52

As such, the outputs (Yout, Mout, Cout, BKout) of the BK generation will be as follows:

Yout = Y – ßMin (YMC)
Mout = M – ßmin (YMC)
Cout = C – ßmin (YMC)
BKout = ßmin (YMC)

10. Color Compensation (toner)

In color compensation, the reflective characteristics of each toner (Y, M, C, BK) of the printer are corrected. The mechanism is explained below using the M toner.

An "ideal" M toner is one that absorbs 100% of light with a wave length of 500 nm to 600 nm (green) and reflects light with a wave length of 500 nm or less and 600 nm or more. In practice, light falling under a, b, and c in Figure 2-53 exists.

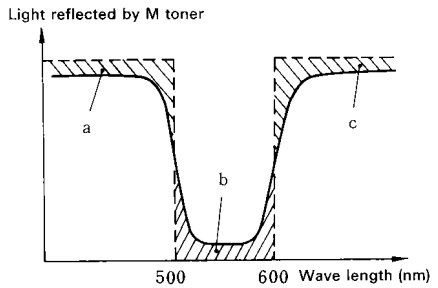

Figure 2-53

Color conversion is performed to correct the condition.

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11. Color/Character Composition

The following processes are performed under the synthesis; the processes are performed within the area specified, and up to 30 areas may be designated.

a. Framing

The signals for areas outside those specified are forced white regardless of the video signal from the document.

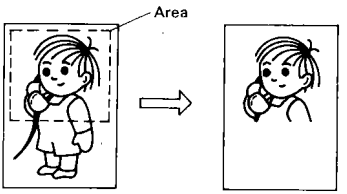

Figure 2-54 Framing

b. Blanking

As opposed to framing, the signals within the areas designated are forced white regardless of the signal from the document.

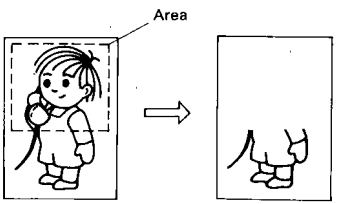

Figure 2-55 Blanking

c. Painting

In this mode, the inside or outside of the areas designated are painted with the color specified.

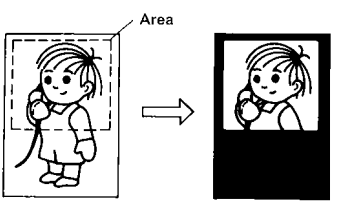

Figure 2-56 Painting

As in the "conversion of specified color," the color of the paint may be chosen from the specified, standard, and registered colors.

d. Negative/Positive Reversal

The video data are reversed to reverse the density level of the document.

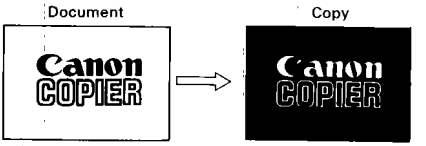

Figure 2-57

e. Character Synthesis (window)

Characters registered in the bit map memory are colored as desired and inserted into the area specified.

Figure 2-58

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f. Character Composition (superimpose)

Characters registered in the bit map memory are colored as desired and the character frames are colored and inserted before insertion into the area specified.

Figure 2-59

g. Contour

The contour of the characters registered in the bit map memory is copied in the color specified, and the inside of the characters is whited out.

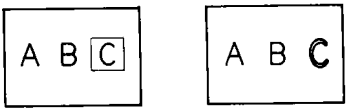

Figure 2-60

12. Color Balance

The image as a whole is processed. The CPU writes conversion data according to the density adjustments specified by the control panel in each conversion table for Y, M, C, and BK. The CPU, thereafter, writes the conversion table for Y, M, C, and BK each into the RAM.

The 8-bit video signals are put into the RAM as addresses, and the RAM outputs the data of the conversion tables according to these addresses.

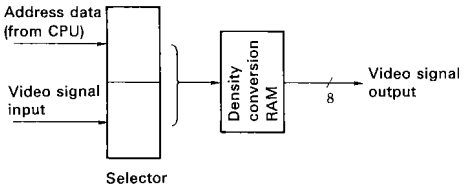

Figure 2-61

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13. Image Shifting and Processing

a. Horizontal Reproduction Ratio (horizontal scanning direction)

The reproduction ratio in the horizontal scanning direction is changed by omitting data bits while writing data into memory (REDUCTION) or reading data bits more than once when reading from memory (ENLARGEMENT).

b. Vertical Reproduction Ratio (vertical scanning direction)

The reproduction ratio in the vertical scanning is changed by the scanner moving faster (REDUCTION) or slower (ENLARGEMENT) to change the width of the area on the document during reading for one bit.

Table 2-5 shows the reproduction ratio processing method.

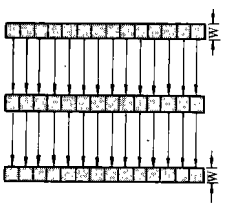
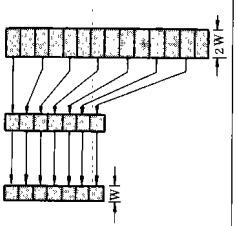
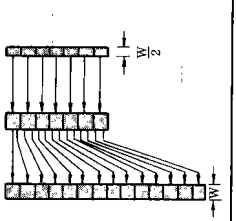
	DIRECT	REDUCTION	ENLARGEMENT
Document (image data) Data in line memory (writing) Data used for copy (reading)			
Horizontal scanning	All data are written into memory unmodified and read out and used for the copy with no changes.	If the size of the original image is being reduced by half, for example, only every second item of image data is written to memory.	If the size of the original image is being doubled, for example, all data are written to memory unmodified, and each item of image data is read out twice.
Vertical scanning		The speed at which the scanner moves is increased, thereby enlarging the width of the individual image elements read for one line, thus reducing the number of lines per page.	The speed at which the scanner moves is reduced, thereby narrowing the width of the individual image elements read for one line, thus increasing the number of lines per page.

Table 2-5

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b. Image Shift Processing

Figure 2-62 gives a brief overview of the principles of shifting in the horizontal and vertical scanning directions.

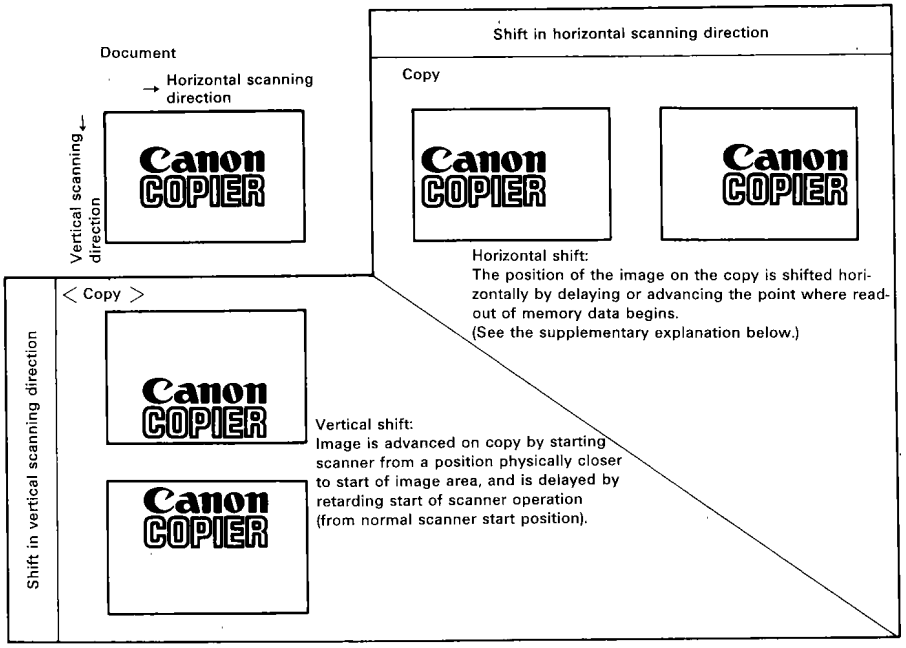
Document
Horizontal scanning direction
Vertical scanning direction
Shift in horizontal scanning direction
Copy
Horizontal shift:
The position of the image on the copy is shifted horizontally by delaying or advancing the point where read-out of memory data begins.
(See the supplementary explanation below.)
Shift in vertical scanning direction
< Copy >
Vertical shift:
Image is advanced on copy by starting scanner from a position physically closer to start of image area, and is delayed by retarding start of scanner operation (from normal scanner start position).

Figure 2-62

Note:
Shift in horizontal scanning direction

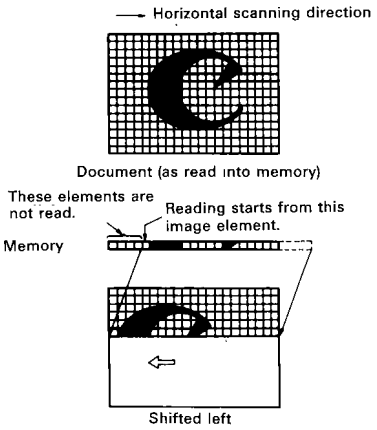

Figure 2-63

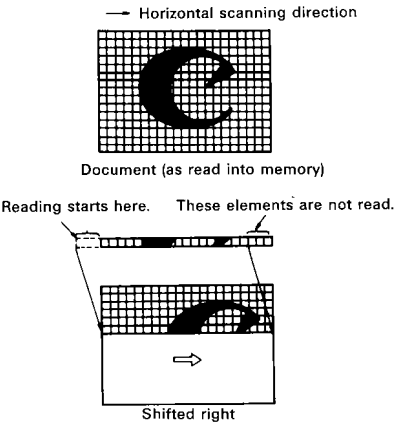

Figure 2-64

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Combining shifting in the horizontal and vertical scanning directions enables documents to make the following moves.

a. Corner Shift

This means that the section of the document (X_1, Y_1) to be shifted can be moved to any of the four corners shown on the copy paper in Figure 2-65.

b. Center Shift

The selected section (rectangular) of the original is centered on the copy. (The coordinates of the upper left corner are calculated (Xm, Ym) so that the spaces are equal end-end, and top-bottom.)

c. Manually-Specified Shifting

The corner (coordinates X_1, Y_1) of the section to be displaced is situated in the copy at the point with specified coordinates (Xp, Yp).

Note:

$$Xm = \frac{Xmax - (X_2 - X_1)}{2}$$

$$Xm = \frac{Ymax - (Y_2 - Y_1)}{2}$$

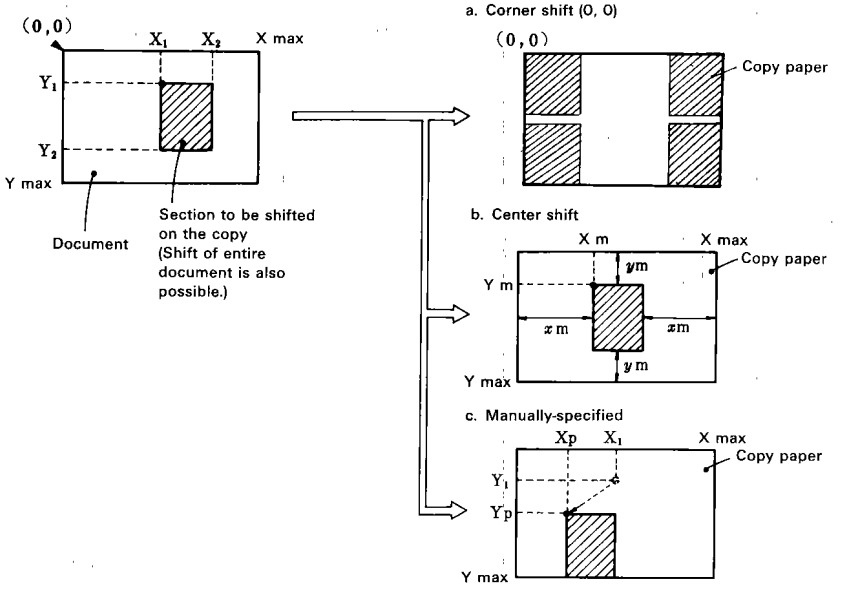

Figure 2-65

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c. Mirror Image

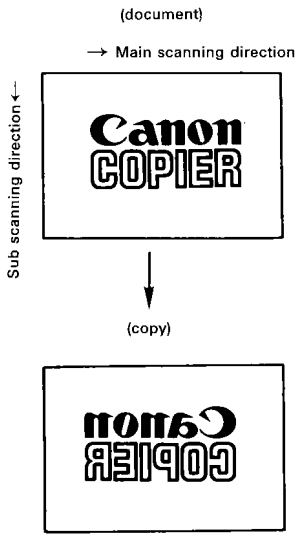

Figure 2-66

Principle

Each single scan of data is read from the RAM starting at the opposite direction to create a mirror image in relation to the main scanning direction.

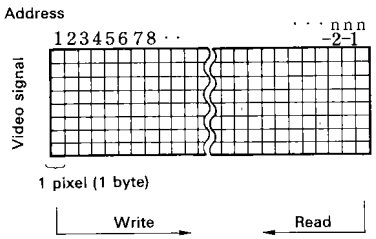

Figure 2-67

d. Symmetric Fold

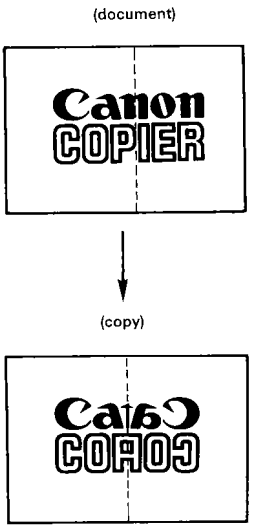

Figure 2-68

Principle

Each scan of data is read from the RAM in regular order up to the point of return and, thereafter, in reverse order to create a folded image in relation to the main scanning direction.

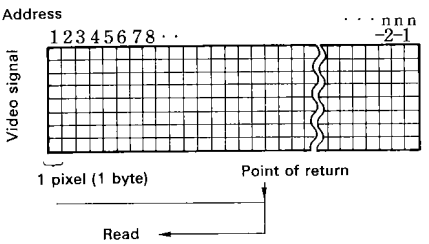

Figure 2-69

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e. Repeat

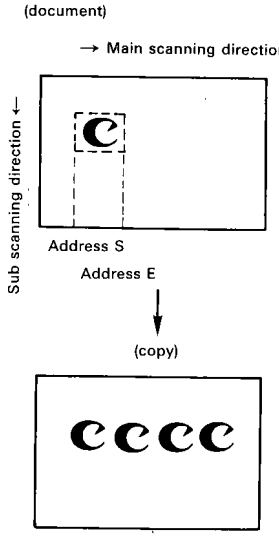

Figure 2-70

Principle

When each scan of data is read from the RAM, the read start address (S) and read end address (E) are specified; thereafter, the data are read starting at address S and, at address E, the same data are read again starting with address S. The operation is repeated as necessary to create repeated images.

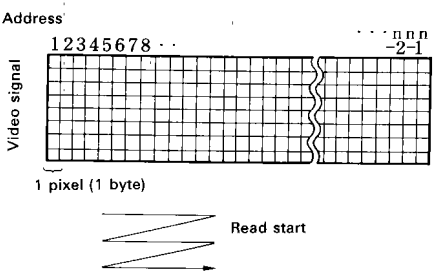

Figure 2-71

f. Image Angle

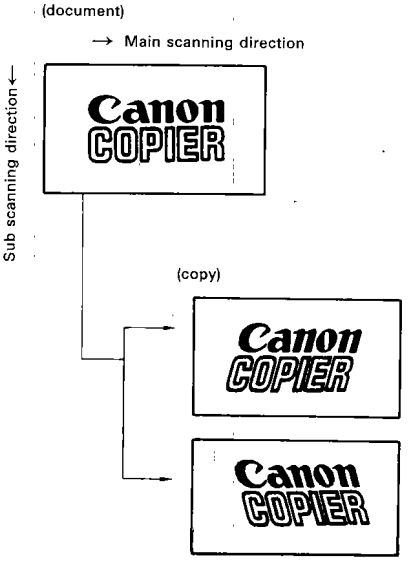

Figure 2-72

Principle

When a single scan of data is read from the RAM, the read start address (S) is shifted for each line to create a slant image.

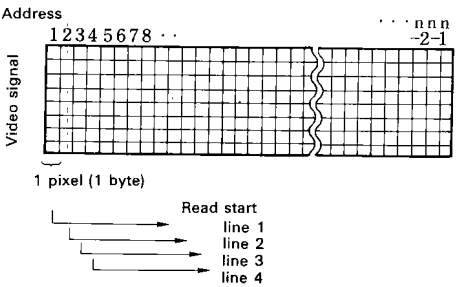

Figure 2-73

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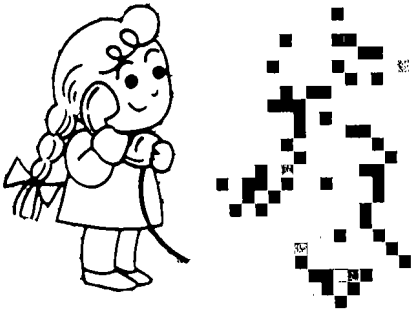
g. Mosaic



Original image Mosaic image

Figure 2-74

When a single scan of data is read from the RAM, the data are read starting with the start address of the area designated; several lines of such data are converted to data of the same density to create a mosaic image.

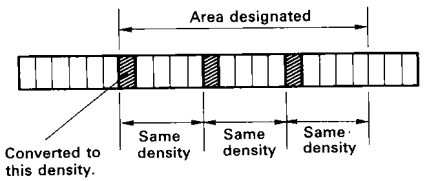


Figure 2-75

14. Texture Processing

Texture processing is used to generate output in which a pattern document and regular document are laid together.

The pattern document is read first and registered in the RAM; the size of the registration is 16 mm × 16 mm. When the regular document is copied, the pattern registered in advance is read from the RAM for output.

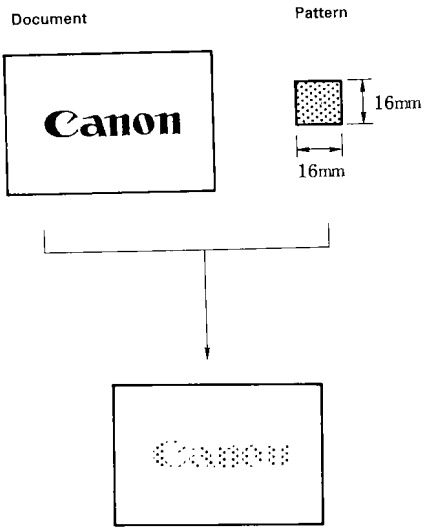


Figure 2-76

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15. Sharpness/Filter Processing

The image data are modified to increase or decrease density transitions of density within the copy (emphasize or de-emphasize boundaries) to suit the sharpness mode specified by the operator via the control panel.

Figure 2-77 shows an example of unmodified input image data. Figure 2-77a shows the output when the high-contrast sharpness mode is specified. In this case, the variation between light and dark in the image is emphasized, and more distinct boundaries are obtained.

Figure 2-77b shows the output when the low-contrast sharpness mode is specified. Variation in the image between light and dark is smoothed out, resulting in a softer output image.

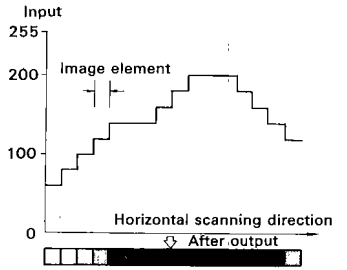

Figure 2-77 Input level

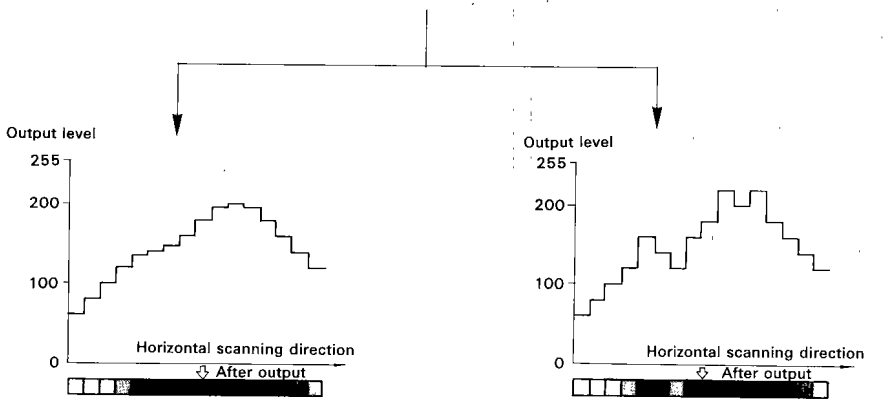

Figure 2-77a Low-contrast sharpness mode

Figure 2-77b High-contrast sharpness mode

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16. Black Type Enhancement

In this process, the photo and black characters within an image are identified, and the edges of black characters are enhanced for better reproduction.

The identification, however, can fail for the following:

i. Section with a group of lines; lines found at shorter intervals tend to lead to wrong identification.
ii. Sections adjacent to white characters within a solid black image.
iii. Characters formed of dots (mono-color).
iv. Group of lines found at an angle of about 45 deg.
v. Background with a density (non-white; e.g., sections of tracing paper or catalog).
vi. Section with both thick line (about 1 mm or more) and thin line (about 1 mm or less) within a character; the thick line may not be enhanced.
vii. Document with light lines; or, documents not lying flat.
viii. Zoom at 101% to 200%; may not fail in DIRECT (black text enhancement is not available for 201% or more).

If any of the above is noted, perform the following to ensure correct enhancement:

Method 1

1) Press the ✳ key on the control panel.
2) Press the ➡ key found at the lower right of the touch panel to specify black text enhancement.
3) Press the black type enhancement key.
4) Set the level closer to 'LOW' so that the identification will be correct. At the farthest left of 'LOW', no enhancement is made and, therefore, no wrong identification; at 'HIGH', on the other hand, characters with low density will be enhanced for darker, sharper reproduction (for maps and catalogs).
5) set the level back to its original setting.

Method 2

1) Press the ACS key on the control panel to clear the ACS mode; the level indication for black text enhancement (✳ mode) will remain the same, but no enhancement will occur.
2) Make copies.
3) Press the ACS key.

17. Background Erase (BE) Mode

a. Outline

When copies are made in the BE mode, they will be free of foggy backgrounds. In the BE mode, the copying machine automatically controls the intensity of the scanning lamp (CLC 500) or density correction (CLC 550).

b. Control Mechanism

The density of the document is measured when the DS unit is moved in reverse after it has been moved forward for document detection.

Based on the results of the measurement, the density of the entire document is computed to determine the intensity of the scanning lamp for copy operation (CLC 500) or density correction (CLC 550).

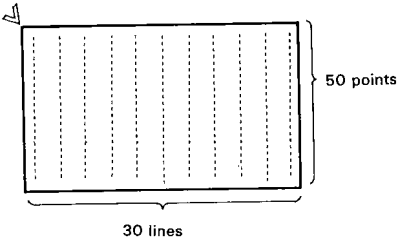

Figure 2-78 Points of Measurement

The BE mode will not be activated for some documents; e.g., photos, which are full-image documents, and documents whose backgrounds are darker than those of newspapers.

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18. Shading Compensation When the Projector Is in Use

During normal copying, shading compensation is based upon the reference density of the standard white plate. However, when the projector is in use, other references are used:

- When positive film is used:
  Do not put any film in the projector. Have the projector lamp shine directly on the copyboard glass. The density measured there is used as the reference.
- When negative film is used:
  Density of the base film (See the note below).

Note:
For negative film, base film refers to areas with white density (i.e., density of areas not exposed to light during filming). The white density differs between the ISO sensitivity and brand of the film.
The projector is supplied with three types of ISO 100 base film from major film manufacturers. When copying from films for which there is no base film, shading compensation should be done using white density areas of the film.

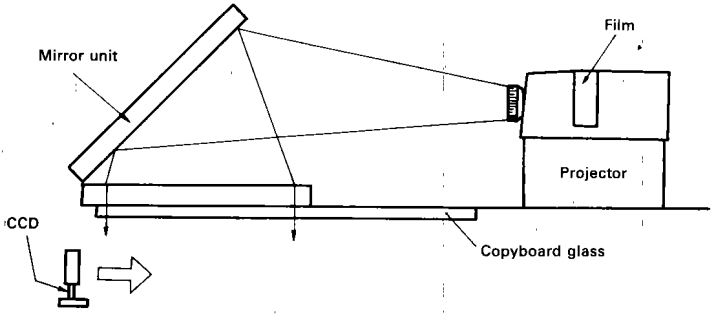

Figure 2-79

When the projector is in use, shading compensation involves two steps:

a. Adjusting the White Level Between Channels

The scanner moves to the center of the projector projection area and lights the projector lamp. CPU reads the maximum density data of each channel output by the CCD, sets the light intensity of the projector to the standard value, and sets the gain data in the analog processor PCB for each channel.

b. Measuring the Shading Compensation Value

- This measurement is identical to "standard white sheet measurement" of normal copying.

The scanner scans areas near the center of the projection area and reads the density of each picture element for 32 lines. The CPU averages data of 32 lines for each picture element, then stores the difference (the shading compensation value) between the average value and the target output (255) in memory for each picture element of the CCD.

When copies are made, the compensation values in memory are used to normalize the output.

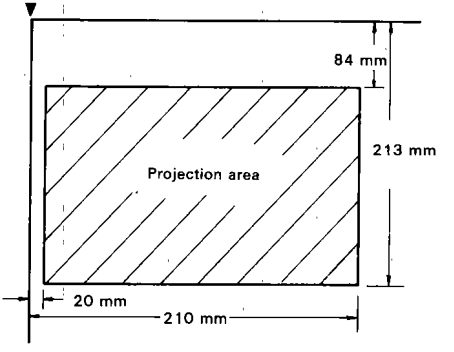

Figure 2-80 Projection area

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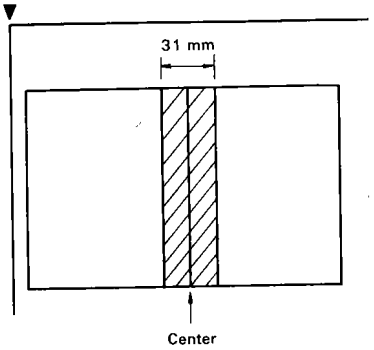

Figure 2-81 Area where projector shading compensation is measured

19. AE (automatic exposure) When the Projector Is in Use

The scanner scans areas near the center of the projection area and stores the density data for 16 lines.

During copying, the CPU optimizes the projector light intensity against the density level in memory.

Changing the copy density from the control panel changes the light intensity from the optimum intensity obtained here. For example, when the copy density is changed from 5 to 6, the light intensity increases for positive film and decreases for negative film.

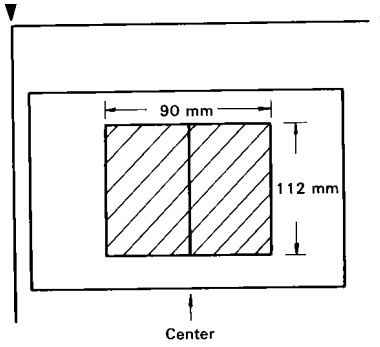

Figure 2-82 Projector AE measuring area

20. Anti-Counterfeiting Functions

The following two functions are used to prevent illegal reproduction of bank notes and securities papers.

a. Counterfeit Tracking Code System

The ID number stored in the copier's memory is printed on all copies in a way not visible to the eye. (Should bank notes or securities papers be copied, the machine used for the purpose may be traced promptly.)

b. Bank Note Recognition System

- If the copier decides that the original placed on the copyboard matches any of the patterns stored in its memory, it generates solid black outputs.
- If a bank note is used among document pages in continuous mode, the copier stops operation as soon as it detects the note.
- If a bank note is detected when the scanner is issuing video signals to an IPU, the copier immediately stops the signal output.

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IV. CONTROL PANEL

A. Outline

The liquid crystal display panel consists of a liquid crystal controller (LCDC), display memory RAM, liquid crystal row driver, and liquid crystal column driver providing up to 128 × 240 dots of display, together with a transparent touch switch panel. Its main features are as follows.

- Liquid crystal display processing
- Touch switch input

B. Operation

a. Liquid Crystal Display Processing

The controller on the operation panel controller circuit passes the commands to the appropriate LCDC in response to its software. The LCDC interprets these commands and executes them. The LCDC performs operations such as switching the display ON/OFF and generating character fonts under control of its software. The LCDC also writes the character codes for display sent from the controller into the sequential display memory RAM.

The data in the display memory RAM are transferred to the column driver via the local bus at a fixed point determined by the timing signal generated by the LCDC.

There are six column drivers. Data are written to the column driver determined by the chip select signal generated by the row driver. After display data have been written to all the column drivers, the LCDC issues a strobe signal (STB) and the column driver outputs one line of display data to the liquid crystal display panel. The LCDC repeats this operation while scanning the row signal to display the characters on the display panel.

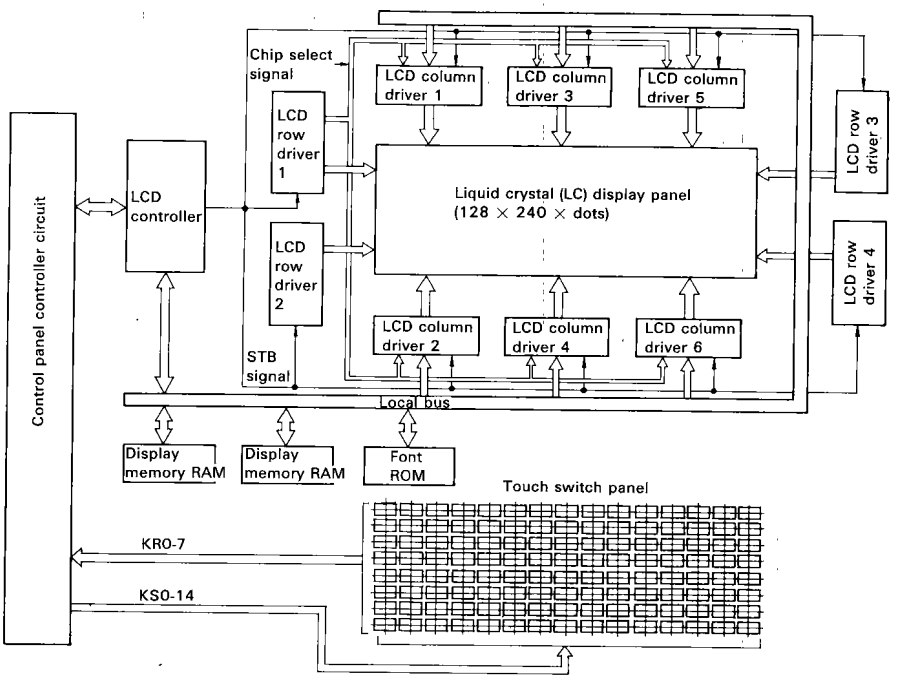

Figure 2-83

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b. Touch Switch Input

The control panel controller PCB and the touch switch panel keys are connected as shown in Figure 2-84. The touch switch panel consists of 8 × 15 keys formed of two sheets of glass covered with a transparent conductive film separated by spacers.

When one of these keys is pressed by the finger or any blunt object, the two sheets of glass contact and a current flows.

This results in a pair of electrodes passing a current which can be used to detect x and y coordinates in the same way as the usual key matrix. That is, the control panel controller can determine which key has been pressed from the correspondence between key scan signals (KS0 to KS14) from the control panel and the signals input to the controller circuit (KR0 to KR7).

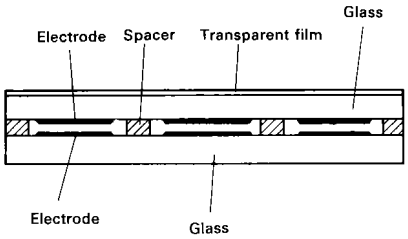

Figure 2-84

c. Liquid Crystal Contrast Adjustment

The liquid crystal display contrast can be changed by adjusting VR1 on the liquid crystal display PCB.

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V. EDITOR

A. Outline

The editor operates by capacitive coupling to determine the position of a stylus that is pressed against positions on a document (placed on a flat tablet) that are to be recorded. There are actually two thin tablets, one atop the other, one to determine x-direction position, and one for the y-direction position.

There is a regular pattern of parallel electrode wires at 6 mm intervals in each tablet, the wires in the two tablets being at right angles to each other.

B. Operation

When the stylus is pressed on the tablet, voltage pulses are applied to each electrode wire in turn (via the two tablet decoders; 1, 2, ..., n-1, n, n+1). The voltage measured is proportional to the distance between the stylus and the wire. By this means the position of the stylus can be identified. See Figure 2-85.

The voltages thus read in are converted into digital signals by the A/D converters in the controller, and then used to identify physical areas (in mm units) on the tablet by arithmetic operations of the CPU. The result is transmitted to the copying machine to identify areas on its copyboard.

Note:
Because of the principle of operation using an electric field, it can be used even for thick documents (up to 4 mm). However, objects composed of conductive materials, and carbon-backed paper cannot be used.

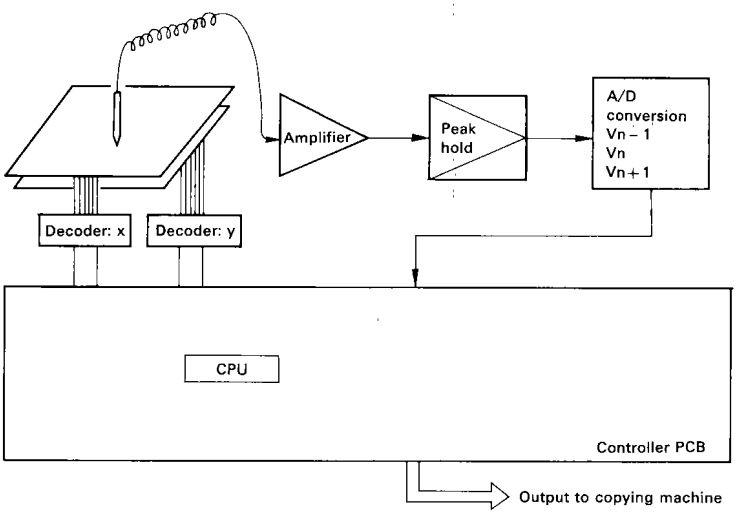

Figure 2-85

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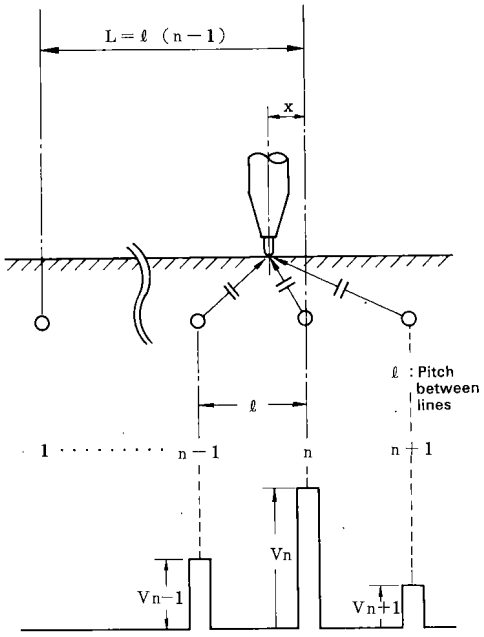

Reference: Detection Method

Pulses applied sequentially to electrode lines (1, ..., n − 1, n, n + 1)

If nth electrode line maximum value is Vn then L = ℓ (n − 1), where ℓ is the pitch between lines

S = Vn − (Vn − 1) and Vn − (Vn + 1) and x is then calculated using the data tables

Values L + x and L − x are obtained where L + x gives the value between n and n + 1 and L − x gives the value between n and n − 1

Figure 2-86

C. Zero Adjustment of the Editor Tablet Unit

If the controller PCB or the tablet unit in the editing unit is replaced, set the DIP switches of the controller PCB as shown on the label of the tablet unit; see Figures 2-87 and -88.

If more zero adjustment is required beyond this , adjust <EDIT ADJ> in the service mode.

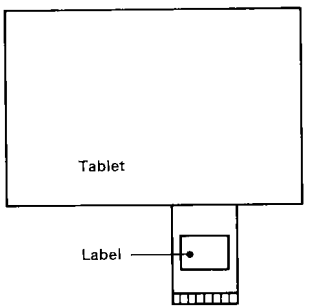

Figure 2-87

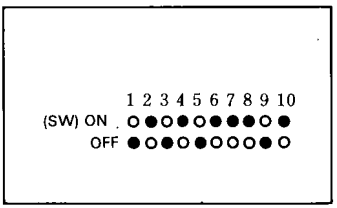

Figure 2-88 Example of setting (●: Toggle position)

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VI. POWER SUPPLY

A. Power Supply

The power inside the scanner is distributed as shown in Figure 2-89. The DC power supply PCB is supplied with AC power when the power switch is turned ON. The DC power supply PCB, in turn, supplies the loads with +24 VDC, +12 VDC, – 12 VDC, +5 VDC, and – 5 VDC.

B. Protection Mechanism

The AC power input side of the DC power supply PCB is equipped with a fuse, and the stabilizing power supply PCB on the DC power output side is equipped with an over-current protection circuit.

Should a DC load short circuit for some reason and experiences an over-current, the protection circuit will be activated and the output from the DC power supply will be cut out.

Should this happen, turn the power switch OFF, remove the cause of the problem, and turn the power switch ON once again. The protection circuit deprives the DC power supply of AC power for about 30 seconds; it can be reset by turning the DC power supply ON once again. Repeated short-circuiting and resetting, however, can blow the fuse built inside the DC power supply.

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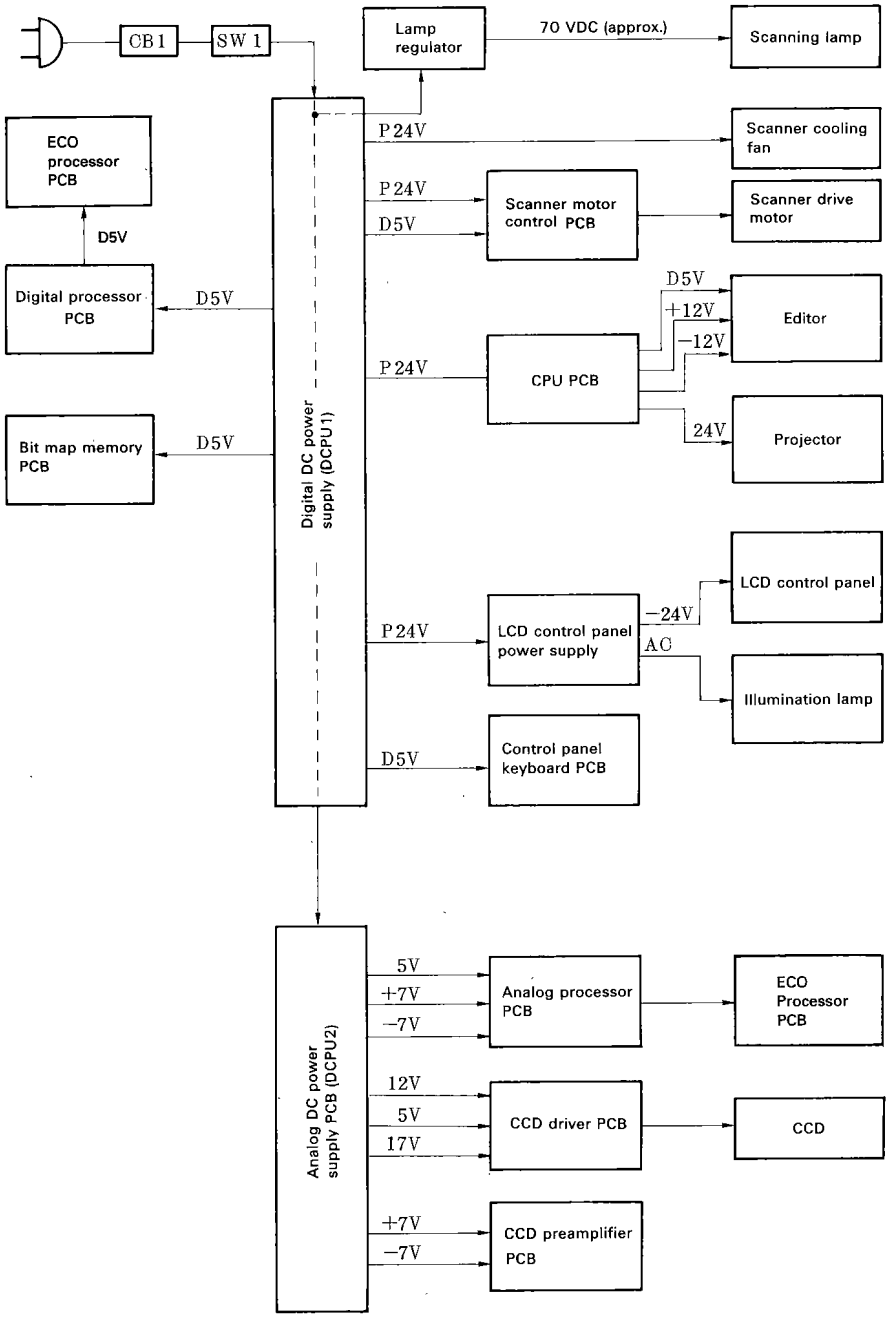

Figure 2-89

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VII. SERVICE MODE

A. General

The scanner SERVICE mode can be used via the touch panel display on the control panel.

Note:
The printer SERVICE mode cannot be used from the scanner control panel.

B. Service Mode Operation

1. Selecting the SERVICE mode

Note:
The SERVICE mode cannot be selected while copies are being made.

1) Press the ⊠ key on the control panel.
2) Press memory keys [M1] and [M4] at the same time.
3) Press the ⊠ key.

2. Leaving the SERVICE mode

1) Return to the <SERVICE> display shown in Figure 2-90.
2) Press the (U) or RESET key.

Note:
The (U) key has no effect during printing in the PRINT mode.

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3. Using the SERVICE mode

The following example shows how to select and use the SERVICE mode (changing input coordinates editor).

1) Select the SERVICE mode.
   - The <SERVICE> screen shown in Figure 2-90 will be displayed.
2) Press (2. ADJUST).
   - The <ADJUST> screen shown in Figure 2-91 will be displayed.
3) Press (1. EDIT ADJ).
   - The <EDIT ADJ> screen shown in Figure 2-92 will be displayed.
4) Press (⇩) or (⇧) to adjust the input coordinates of the editor.
5) Press (↺) to return to the <ADJUST> screen.
6) Press (↺) to return to the <SERVICE> screen.
7) Press (↺) to exit the SERVICE mode.

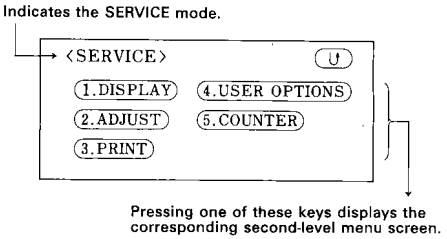

Figure 2-90 First-level menu

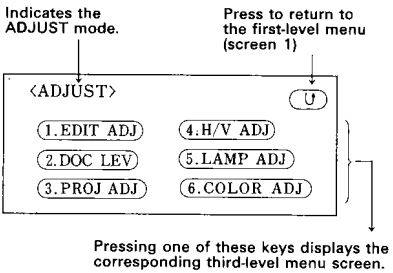

Figure 2-91 Second-level menu

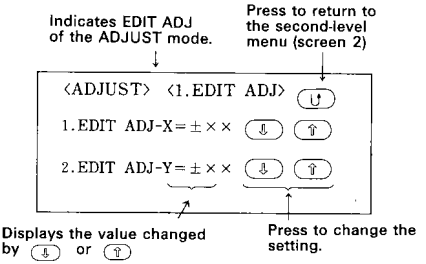

Figure 2-92 EDIT ADJ screen

Note:
When the setting is changed in the <ADJUST> mode, write down the new values on the label.

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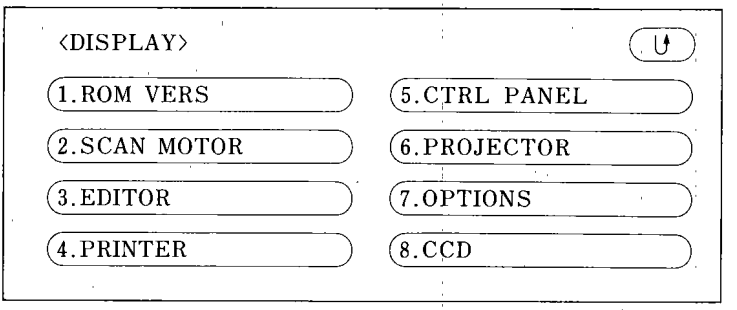
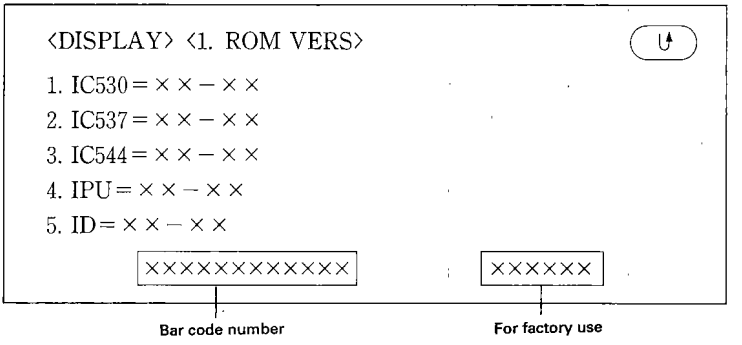
C. Display Mode



Screen 1 Display mode (Second-level menu)

1. ROM version display



Screen 1-1 ROM version display

No.	Indication	Use
1	IC530	Indicates the version of ROM IC530 on CPU PCB.
2	IC537	Indicates the version of ROM IC537 on CPU PCB.
3	IC544	Indicates the version of ROM IC544 on CPU PCB.
4	IPU	Indicates the version of ROM on IPU/PS-IPU.
5	ID	Indicates the version of ROM on ECO processor PCB.

Interpreting the display: ××–××

Indicates version — Indicates language

××–01: Japanese
××–02: English
××–03: Not used
××–04: Not used
××–05: French
××–06: German
××–07: Spanish

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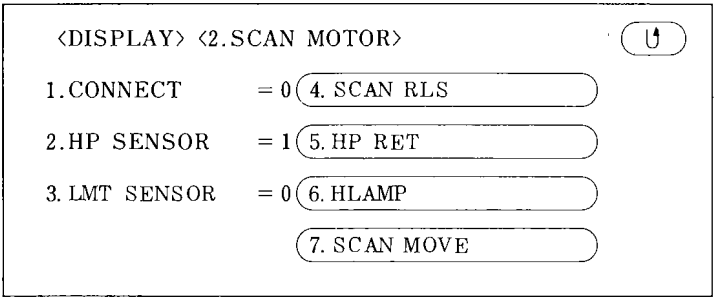
2. Scanner display



Screen 1-2 Scanner display

No.	Indication	Use
1	CONNECT	Indicates whether motor driver PCB and CPU PCB are connected. (0: Connected, 1: Not connected)
2	HP SENSOR	Indicates output of scanner home position sensor (PD2). 1: Scanner is at PD2. 0: Scanner is not at PD2.
3	LMT SENSOR	Indicates output of scanner left travel limit sensor (PD1) and scanner right travel limit sensor (PD4). 1: Scanner is at either PD1 or PD4. 0: Scanner is at neither PD1 nor PD4.
4	SCAN RLS	Press it to release scanner motor brake. • When the brake is released, scanner can be moved by hand to check 2, 3, and 4 above.
5	HP RET	Press it to return scanner to its home position.
6	HLAMP	Press it to switch scanning lamp ON. Press it again to switch lamp OFF; if left alone, forced to go OFF about 50 sec later.
7	SCAN MOVE	Press it to advance scanner 30 mm farther from scanner home position sensor. (Key may be pressed successively.)

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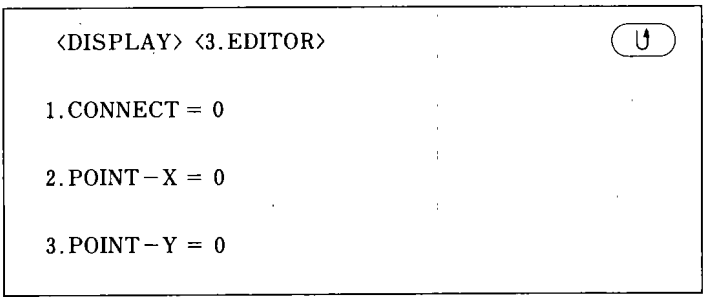
3. Editor display



Screen 1-3 Editor display

No.	Indication	Use
1	CONNECT	Indicates whether editor and CPU PCB are connected. 0: Connected 1: Not connected
2	POINT-X	Displays coordinates entered using editor. X direction: POINT-X Y direction: POINT-Y [Unit 1 = approx. 1 mm]
3	POINT-Y	

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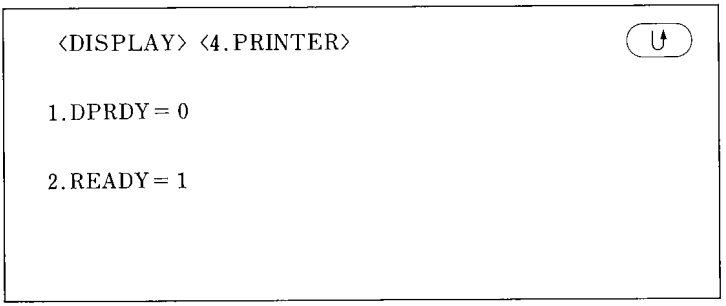
4. Printer display



Screen 1-4 Printer display

No.	Indication	Use
1	DPRDY	0: Scanner is connected to printer, and printer is switched ON. 1: Either scanner is not connected to printer, or printer is not switched ON.
2	READY	Indicates printer readiness. 1: Ready. 0: Not ready.

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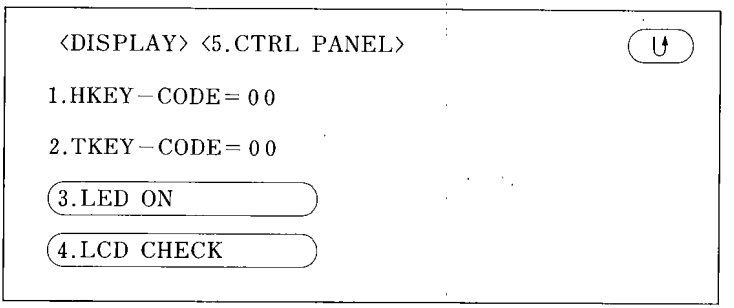
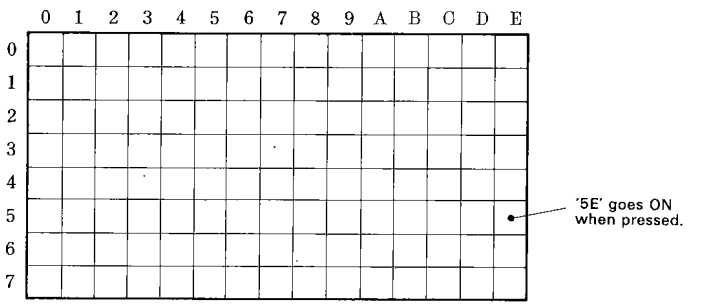
5. Control panel display



Screen 1-5 Control panel display

No.	Indication	Use
1	HKEY	A press on any of the keys on the control panel brings up the code No. of the key pressed. (See the table below.)
2	TKEY	A press on any of the keys on the LCD display brings up the code No. of the key pressed. (See the table below.) A press on (3. LED ON) or (4. LCD CHECK) executes the mode selected.
3	(LED ON)	A press on the key causes the LED on the control panel to flash. (Another press causes it to go OFF.)
4	(LCD CHECK)	A press on the key causes all indications on the LCD display to go ON; 5 sec later, all go OFF.



TKEY Display codes table

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HKEY Display Codes Table

Key code	Key name	Key code	Key name
01	P1	20	Mirror image
02	P2	21	Profile
03	P3	22	Texture
04	P4	23	Mozaic
05	M1	24	Sharpness
06	M2	25	Image repeat
07	M3	26	Slant
08	M4	27	Shift
09	Standby	28	Page separation
0A	Remote	29	Screen processing (CLC 500) Two-sided (CLC 550)
0B	Center shift		
0C	Document detection	2A	Projector
0D	ID	2B	External device
0E	ACS	2C	*
0F	Black	2D	Recall
10	Guide	30	0
11	Reset*	31	1
12	Copy start	32	2
13	Zoom	33	3
14	Zoom program	34	4
15	Enlarge/Page separation	35	5
16	Overlay	36	6
17	Character add-on	37	7
18	Color balance	38	8
19	Color mode	39	9
1A	User's color	3A	Clear/Stop
1B	Paint		
1C	Image conversion		
1D	Framing		
1E	Blanking		
1F	Partial processing		

* Press to leave the service mode.

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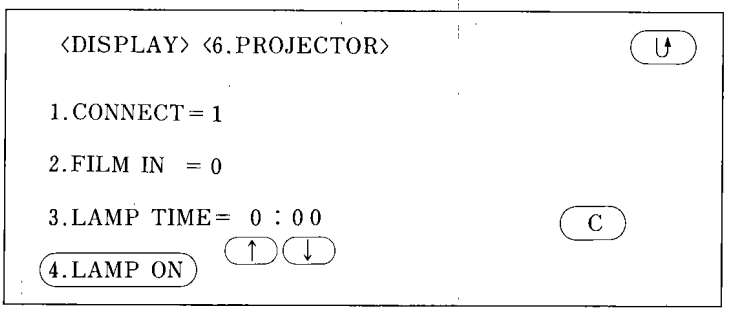
6. Projector display



Screen 1-6 Projector display

No.	Indication	Use
1	CONNECT	Indicates whether scanner and projector are connected. 0: Connected 1: Not connected
2	FILM IN	Not used.
3	LAMP TIME	Indicates cumulative time during which projector halogen lamp was ON in 1-minute increment. Press the C key to clear the counter after replacement of the lamp. Press the ↑ key to increase the count after replacement of the CPU PCB.
4	LAMP ON	Press it to switch projector lamp ON. Press it again to switch lamp OFF.

Note:
Leaving the service mode by pressing the <RESET> indication will not clear the projector mode; press it once again.

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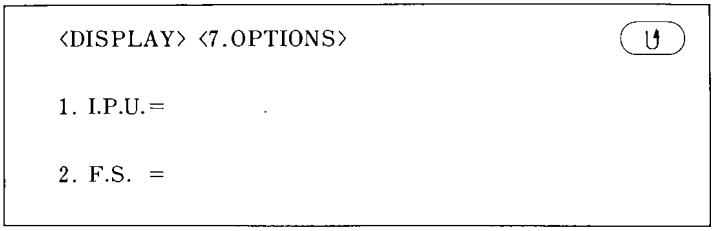
7. External Device Display



Screen 1-7

No.	Indication	Use
1	I.P.U.	Indicates connection between scanner and IPU. 0: Not connected. 1: Connected.
2	F.S.	Indicates connection between scanner and FS. 0: Not connected. 1: Connected.

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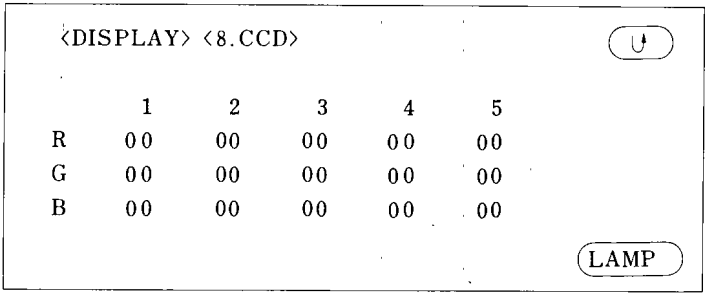
8. CCD display



Screen 1-8 CCD display

No.	Indication	Use
1	R G B	Use it to check if the video data read by the CCD is sent to the digital processor PCB. 0: Data is not sent. 1: Data is sent. **Note:** 1. 1 through 5 (across) refer to channels; R, G, and B (down) refer to data for each color. 2. Checks on the video data are not for the entire length of a single scan; they are based on data sampled.
2	LAMP	Press the key to cause the scanning lamp to go ON; press it again to cause the lamp to go OFF.

Checks

1) Enter the service mode, and select <DISPLAY> <2. SCAN MOTOR>.
2) Click SCAN MOVE to move the scanner to the center.
3) Select <DISPLAY> <8. CCD>.
4) Press LAMP, and hold it for one to two seconds.
5) Place a blank sheet of paper over the DS unit, and check that all indications are '01'.
6) Place a solid black sheet of paper over the DS unit, and check that all indications are '00'.
   If all indications are '01', the length between the CCD and analog processor PCB may be assumed to be normal.

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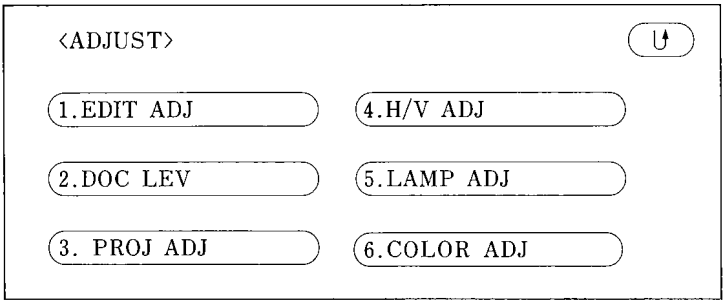
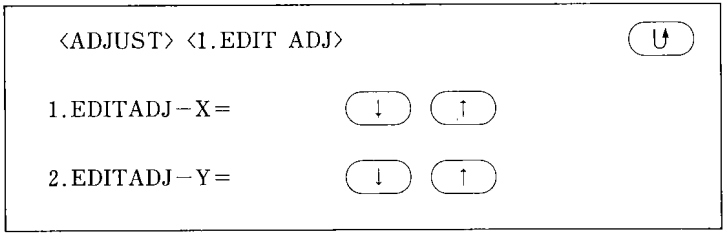
D. Adjustment Mode

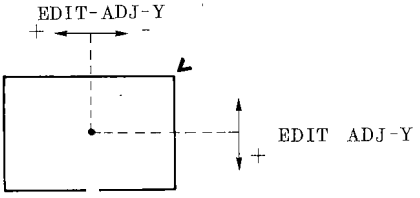


Screen 2 Adjustment mode (second-level menu screen)

1. Editor adjustment



Screen 2-1 Editor adjustment

No.	Indication	Use	Range of settings
1	EDIT ADJ-X	Setting coordinates using editor. • Standard value is "0".  **Note:** After adjustment, write the new values on the label shown in Figure 2-93A.	−99 to +99 −12.6 to +12.6 mm 1 unit = approx. 0.13 mm
2	EDIT ADJ-Y		

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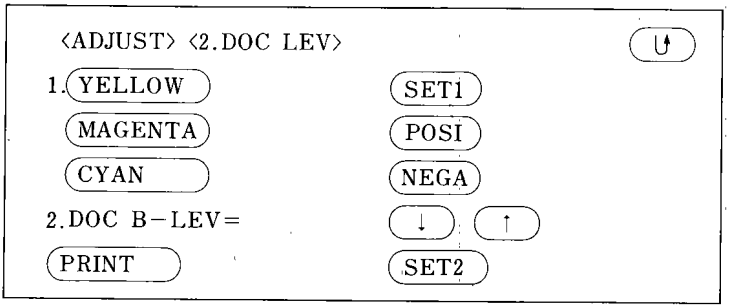
2. Document recognition sensitivity adjustment/white level adjustment



Screen 2-2 Document recognition sensitivity adjustment/white level adjustment

No.	Indication	Use	Range of settings
1	YELLOW MAGENTA CYAN	Press any indication to display the adjustment screen (ADJ-1) for the selected color.	
	SET1	Press this indication to change the display to SET and set the 15 items of data shown on screens 2-2-1. When all data has been set, the display automatically returns to SET.	
	POSI NEGA	Press to correct irregularities on copies (positive, negative) made from projector.	
2	DOC B-LEV	For adjusting the white level. Adjust the standard value for shading compensation according to the density of the standard white sheet. • Increasing the "DOC B-LEV = ××" value decreases the standard value for shading compensation, resulting in darker halftone areas. • Decreasing the "DOC B-LEV = ××" value increases the standard value for shading compensation, resulting in lighter halftone areas.	0 to 99
	SET2	Press this indication to change the display to SET and to light the scanning lamp. The scanner moves beneath the copy paper and measures the density of the paper. Next, the scanner moves underneath the standard white sheet, measures the density of the sheet, and automatically sets the <DOC B-LEV> value based on the difference in densities of the copy paper and the standard white sheet. After the adjustment, the display automatically returns to SET.	
	PRINT	Press this indication to start normal copying.	

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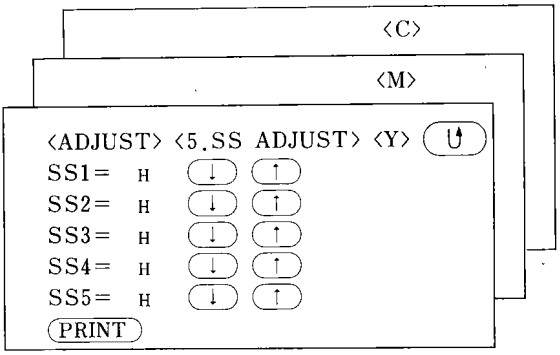

Screen 2-2-1

No.	Indication	Use
1	PRINT	Press indication to make copies using only one of the B, G, or R filters. For example, when the <Y> screen appears, copies are made using only the B light component.

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a. Adjusting "DOC B-LEV" (CLC 500)

Note:
Clean or adjust the following parts before making this adjustment.
- **Make 16-gradation test prints in the printer and make sure the printer is not the cause of fogging or poor halftones.**
- **Clean and check the scanning lamp, reflector, fiber optic lens array, and copyboard glass (be careful when cleaning the back surface of the glass facing the standard white sheet).**
- **Adjust the intensity of the scanning lamp <5. LAMP ADJ>.**

1) Reset the "Color Balance Memory" and press the RESET key.
2) Place 10 or more sheets of copy paper on the copyboard glass.
   - Use A3, A4, or Ledger copy paper. Place A4 or Ledger paper in the cross-feed direction. (Use the same type of paper that was used for <LAMP ADJ>.)
3) Select <ADJUST> <6. COLOR ADJ> of the SERVICE mode, and set the value to '0'.
4) Enter the SERVICE mode and select <2. DOC LEV>.
5) Press the (SET 2) indication. (Do not open the editor until the display returns to (SET 2).)
   - The scanner sets the <DOC B-LEV> value.
6) Remove the copy papers from the copyboard glass and position the CA-1 test sheet in its place.
7) Press the (PRINT) indication. Check the image for fogging and the density of gray scale No. 8.
   - Go to step 9) if the image is acceptable.
8) When the image is fogged, press the (⇩) indication to increase "DOC B-LEV = ××" by about 10.
   When gray scale No. 8 is not visible, press the (⇧) indication to decrease "DOC B-LEV = ××" by about 10.
9) Repeat steps 6) and 7) until the image has no fogging and gray scale No. 8 is barely visible.
10) Write the new value on the label.

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b. Adjusting 'DOC B-LEV' (CLC550)

Note:
Before making the following adjustments, be sure to have gone through the following:
- **Make 16-gradation test prints using the printer unit to make sure that the printer unit is free of causes for fogging or half-tone generation failure.**
- **Check and clean the scanning lamp, reflector, lens array, and copyboard glass (in particular, the white density calibration plate and the glass surface on which copy paper is placed).**
- **Adjust the intensity of the scanning lamp; <5. LAMP ADJ>.**

1) Before starting service mode, clear 'color balance memory', and press the RESET key.
2) Place ten or more sheets of copy paper and the white density calibration plate on the copyboard; then, close the editor.
- Use copy paper of A3, A4, or LDG; if A4/LDG, place it horizontally. (Make sure the copy paper is of the same type as that used for <LAMP ADJUST>.)

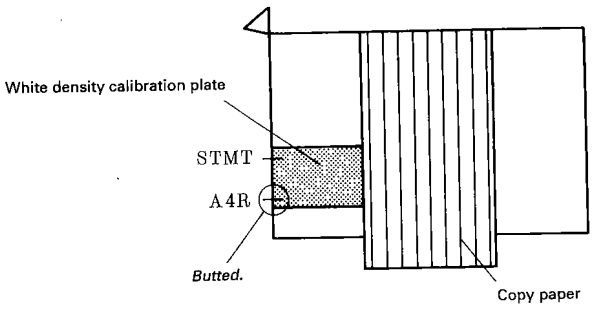

Figure 2-93

3) Select <6. COLOR ADJ> under <ADJUST> in service mode, and set it to '0'.
4) Start service mode, and select <2. DOC LEV>.
5) Press the (SET2) key under <DOCB-LEV>. (Do not open the editor until the notation returns to (SET2).) After setting 'SET2', the indication should read 'DOC B-LEV=04'.
- These adjustments will store the settings for 'DOC B-LEV' and 'bar code label. If E353 is indicated while executing <DOC B-LEV>, check the white density calibration plate for scratches and dirt. If the plate is free of scratches or dirt, check if the density of the paper is not excessively dark; if dark, try paper with a lower density.

6) Remove the copy paper from the copyboard glass, and set Test Sheet CA-1.
7) Press the (PRINT) key, and check the presence/absence of fogging and the density of gray scale No. 8.
- If the result is good, go to step 9).

8) If fogging is noted, press the (↑) key to increase the setting of 'DOC B-LEV=xx' by '1'.
9) Repeat steps 7) and 8) until the print-out shows no fogging while barely showing gray scale No. 8.
10) Record the new settings on the Service Label.

Note:
As a rule, you may skip steps 6) through 10).

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c. Adjusting differences in density between CCD blocks (CLC 500/550)

Notes
Whether step 4) (SET) should be done is determined by the presence of density differences between CCD blocks.
- **Take all steps in the following cases.**
  After part replacement or
  when differences in density are noticeable beween CCD blocks.
- **Do not do step 4) (SET) when adjusting fine differences in density.**

1) Select SINGLE-COLOR COPY set DOCUMENT DETECTION mode OFF, and install an A4/LETTER CASSETTE before selecting the SERVICE mode.
2) Place the test sheet D-10 (FY9-9129) on the copyboard glass with its lighter edge at the left end of the copyboard.
3) Enter the SERVICE mode and select <2. DOC LEV> (Screen 2-2). Make sure (POSI) is selected. For negative copies using the projector, select (NEGA).
4) Press the (SET1) indication in SS-ADJUST. (Wait until the indication returns to (SET1).
5) Select <YELLOW> (Screen 2-2-1).
6) Press the (PRINT) indication. This makes a test copy.
7) If the area on the copy corresponding to CH2 is light, as shown in Figure 2-94, press the (⇩) indication to increase the CH2 setting (SS2 = ××) by one or two.
   - When NEGATIVE is selected and the area on the copy corresponding to CH4 is light, as shown in Figure 2-95, press the (⇧) indication to decrease "SS4 = ××" by one or two.
8) Press the (PRINT) indication again. Check for differences in density in the five areas covered by the different CCD blocks.
9) Press the (↺) to return to Screen 2-2.
10) Select <MAGENTA> and make the adjustments in the same manner as in steps 6) through 9).
11) Select <CYAN> and make the adjustments in the same manner as in steps 6) through 9).

Note
1. The reference value in ADJ-1 screen (Screen 2-2-1) is E0.
2. After making the adjustment, write the adjustment values on the label.

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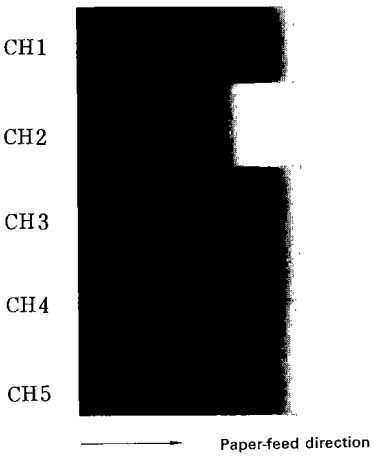

Figure 2-94 When "POSI" is selected

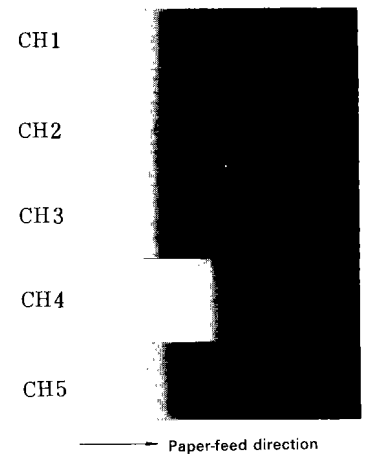

Figure 2-95 When "NEGATIVE" is selected

d. After replacing parts (CLC 500)

Note:
Check, clean, or adjust the following before making the adjustments:
- **Scanning lamp**
- **Reflecting shade**
- **Lens array**
- **Document glass (behind white standard sheet)**

1) Clear <COLOR BALANCE MEMORY> and press the RESET indication; thereafter, select <DOCUMENT DETECTION OFF> and <A4/LETTER CASSETTE>.
2) Place ten sheets of copy paper on the copyboard glass.
- Use A3, A4, or ledger sheets; if A4 or ledger, orient them breadthwise.

3) Select <ADJUST> <6. COLOR ADJ> of the SERVICE mode, and set the value to '0'.
4) Enter the SERVICE mode, and select <2. DOC LEV>.
5) Select (POSI), and press the (SET1) indication; wait until the (SET) indication returns.
6) Select <ADJUST> <5. LAMP ADJ>.
7) Press the (SET) indication; wait until the (SET) indication returns.
8) Select <ADJUST> <2. DOC LEV>.
9) Select (POSI), and press the (SET2) indication of "DOC B-LEV".

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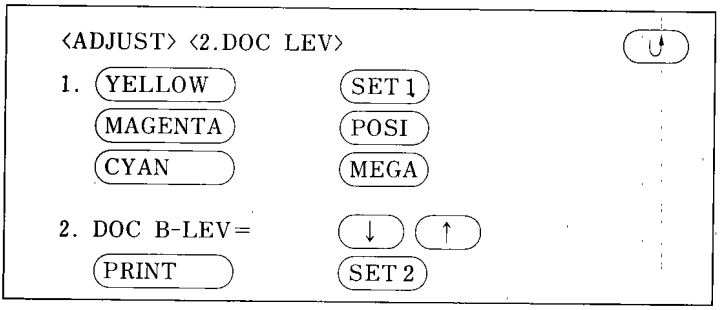
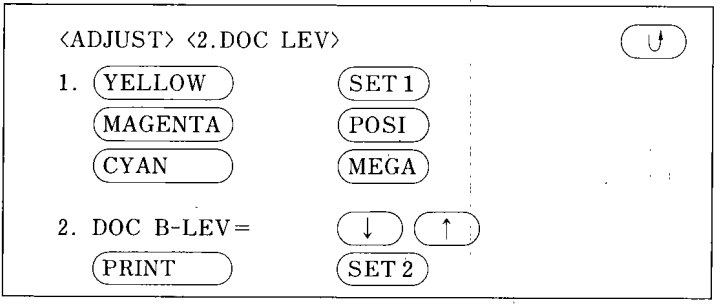


Screen 2-2-2

10) Press the ⇩ indication until the value for "DOC B-LEV" is '1/2'.
11) Check that POSI is selected, and press the SET 1 indication.
12) Select NEGA and press the SET 1 indication.
13) Check that NEGA is selected, and press the SET 2 indication.



Screen 2-2-3

14) Check that NEGA is selected, and press the SET 1 indication.
15) Place the test sheet D-10 (FY9-9129) on the copyboard glass with its lighter section as the leading edge.
16) Select POSI.
17) select <YELLOW>; Screen 2-2-1.4
18) Press the PRINT indication to make test copies.
19) Press the ⇩ key to increase the value of "SS2=XX" by one or two if CH2 is too light as shown in Figure 2-94.
- If NEGA is selected, press the ⇧ indication to decrease the value of "SS4=XX" by one or two if CH4 is too light as shown in Figure 2-95.

20) Press the PRINT indication once again to check the density differences between channels.
21) Press the ↺ key to return to Screen 2-2.
22) Select <MAGENTA>, and repeat steps 18) through 21).
23) Select <CYAN>, and repeat steps 18) through 21).
24) Select NEGA, and repeat steps 17) through 23).

Note:
1. The reference value in ADJ-1 (Screen 2-2-1) is E0.
2. After making the adjustment, write the adjustment values on the label.

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e. After Replacing Parts (CLC550)

Note:
Before making the following adjustments, be sure to have gone through the following:
- **Check and clean the scanning lamp, reflector, lens array, and copyboard glass (in particular, the glass back of the standard white sheet and the area on which the white density calibration plate and copy paper are placed.)**

1) Before starting service mode, clear <color balance memory>, and press the RESET key. Then, select <document detect OFF> and <A4/LTR cassette>.
2) Place ten sheets of copy paper on the copyboard glass.
- Use A3, A4, or LDG paper; if A4, place it horizontally.

3) Select <6. COLOR ADJ> under <ADJUST> in service mode, and set it to '0'.
4) Start service mode, and select <2. DOC LEV>.
5) Select (POSI), and press the (SET1) key; then, wait until (SET1) is indicated.
6) Select <5. LAMP ADJ> under <ADJUST>.
7) Press the (SET) key; then, wait until (SET) is indicated.
8) Select <2. DOC LEV> under <ADJUST>.
9) Place the white density calibration plate and ten or more sheets of copy paper on the copyboard glass; then, close the editor.
- Use A3, A4, or LDG paper; if A4, place it horizontally. (Make sure the copy paper is of the same type as that used for 'LAMP ADJUST'.)

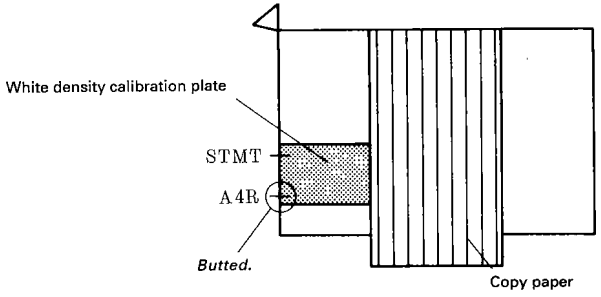

Figure 2-96

10) Select (POSI), and press the (SET2) key under 'B-LEV'.
11) Check that (POSI) is selected, and press the SET1 key.
12) Select (NEGA), and press the (SET1) key.
13) Check that (NEGA) is selected, and press the (SET2) key.

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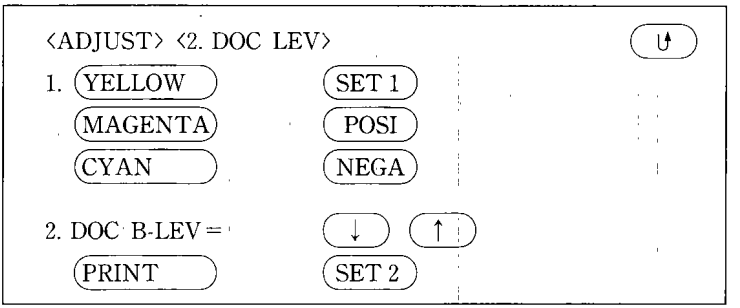

Screen 2-2-4

14) Check that (NEGA) is selected, and press the (SET 1) key.
15) Set Test Sheet D-10 (FY9-9129) on the copyboard so that the side with lighter images is the leading edge.
16) Select (POSI).
17) Select <YELLOW> (screen 2-2-1).
18) Press the (PRINT) key, and make test copies.
19) If the test copies show lighter CH2 as shown in Figure 2-94, press the (⇩) key to in crease the setting for 'SS2=xx' by '1' or by '2'.

■ If (NEGA) is selected, the opposite is true; if CH4 is too light as shown in Figure 2-95, press the (⇧) key to decrease the setting for 'SS4=xx' by '1' or by '2'.

20) Press the (PRINT) key once again, and check the difference in density among channels.
21) Press the (↺) KEY to return to screen 2-2.
22) Select <MAGENTA>, and repeat steps 18) through 21).
23) Select <CYAN>, and repeat steps 18) through 21).
24) Select (NEGA), and repeat steps 17) through 23).

Note:
1. The standard setting for 'ADJ-1' (screen 2-2-1) is 'E0'.
2. After adjustment, be sure to record the new settings on the label.

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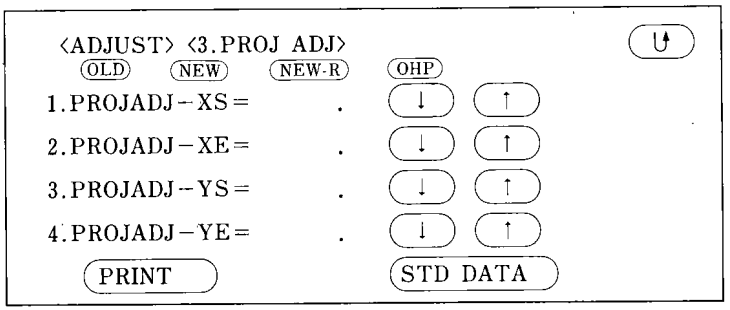
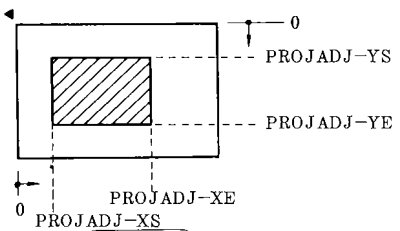
3. Projector adjustment



Screen 2-3 Projector adjustment

No.	Indication	Use	Range of settings
1	PROJADJ-XS	Setting projector image reading area.	0 to 420
2	PROJADJ-XE		0 to 420
3	PROJADJ-YS		0 to 297
4	PROJADJ-YE		0 to 297 Unit = 1 mm
			
		Press the (STD DATA) indication to change the four settings to the reference values.	
	(PRINT)	Press this indication to make a copy using the setting in effect before the service mode was entered.	
	(OLD)	Press this indication to adjust the area using the old type projector.	
	(NEW)	Press the indication to adjust the area for film placed vertically.	
	(NEW-R)	Press the indication to adjust the area for film placed horizontally.	
	(OHP)	Press the indication to adjust the area for OHP film.	
	(STD DATA)	Press the indication to change the settings to the reference values.	

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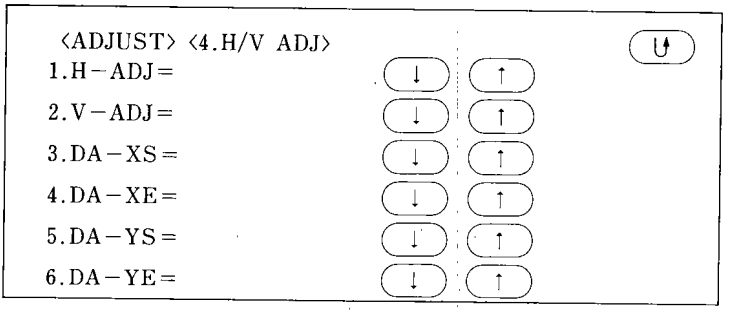
Adjustment procedure

Before this adjustment, check that the optical axis of the projector is set correctly, then make adjustments to avoid the shadows of the "slide carrier" or "mount of film" on the copy.

1) Set the "slide magazine" and an empty "slide carrier" in the projector.
2) Select the POSITIVE projector mode, perform shading, focus the lens of the projector on the slide carrier, then press END.
3) Select DIRECT copying, A4 or Letter, non AE mode and SINGLE-COLOR copying.
4) Enter the SERVICE mode and select <3. PROJ ADJ>.
5) Select the projector type; OLD, NEW, NEW-R, or OHP.
6) Press (PRINT). If the shadow cast by the slide carrier is visible on the copy, adjust the reading area for the projector image as shown above.
7) Reset the slide carrier and do step 6) again. Repeat this five to six times.
8) Remove the magazine from the projector and mount the "slide changer" and the "base film".
9) Press (PRINT). If the shadow cast by the mount of base film is visible on the copy, adjust the reading area for the projector image.
10) Reset the base film and do step 9) again. Repeat this five to six times.
11) Write the new value on the label.

4. Image registration/document detection area adjustment



Screen 2-4 Image registration adjustment

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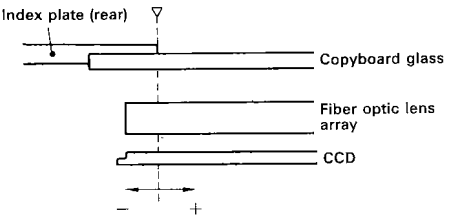
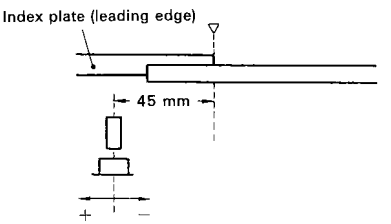
No.	Indication	Use	Range of settings
1	H-ADJ	Adjusting image registration in horizontal (right and left) scanning direction. This adjustment varies the position relative to the edge of the document (index plate) where the CCD begins to read.  **Notes:** 1. This should be adjusted after the DS unit or copyboard glass, etc., has been changed. 2. After making the adjustment, write the new value on the label.	–31 to +31 (–2 to +2 mm) Unit = approx. 0.06 mm The standard value is 0.
2	V-ADJ	Adjusting image registration in vertical scanning (leading edge) direction. This adjustment varies the scanner home position.  **Notes:** 1. This should be adjusted after the copyboard glass or left copyboard glass retainer, etc., has been replaced. 2. After making the adjustment, write the new value on the label.	–31 to +31 (–3 to +3 mm) Unit = approx. 0.1 mm The standard value is 0.

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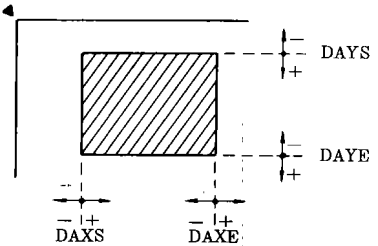
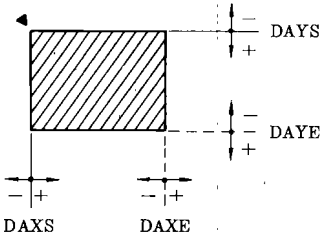
No.	Indication	Use	Range of settings
3	DAXS	Adjusting of document detection area	−63 to +63
4	DAXE		
5	DAYS	1. When document detection mode is ON In the document detection mode, the document should be positioned on the copyboard glass exactly. If it is at an angle, a black frame may appear on the copy around the image. Select settings that prevent frames from appearing on the copy.	(−15.75 to +15.75 mm) Unit = 0.25 mm
6	DAYE	 2. When document detection mode is OFF When document detection mode is OFF, the document is assumed to be the same size as the selected paper size, and the area is determined assuming that the document firmly contacts the left and rear index plates. For fine adjustment of this area, select settings that prevent frames from appearing on the copy.  3. In PROJECTOR mode The above settings are ignored when the PROJECTOR mode is being used, the document detection area is determined by the <3. PROJ ADJ> setting. **Notes:** **After making the adjustment, write the new value on the label.**	Reference settings DAXS = +8 DAXE = − 8 DAYS = +8 DAYE = − 8

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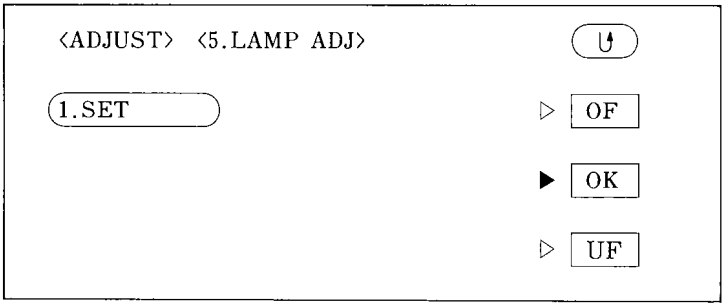
5. Lamp intensity adjustment

Clean and check the scanning lamp, reflector, fiber optic lens array and copyboard glass (be careful when cleaning the back surface of the glass facing the standard white sheet) before making this adjustment.



Screen 2-5 Lamp intensity adjustment

No.	Indication	Use
1	(SET)	A press on the key causes the scanning lamp to go ON; the scanner moves to the copy paper, and the lamp intensity is adjusted automatically. After the adjustment, the result is indicated, and the scanner is returned to home position.
2	▷ OF ▶ OK ▷ UF	Indicates which way to turn the VR to produce the correct lamp output.

Adjustment procedure

1) Place ten or more sheets of copy paper (see the Note) on the copyboard glass.

Note:
Use A3, A4, or Ledger copy paper. Be sure to use paper intended for color copying machines.

2) Press the (SET) key.
- If ▲ is at 'OK', adjustment is complete.
- If ▲ is at 'OF', adjustment not possible (intensity is too high).
- If ▲ is at 'UF', adjustment not possible (intensity is too low).

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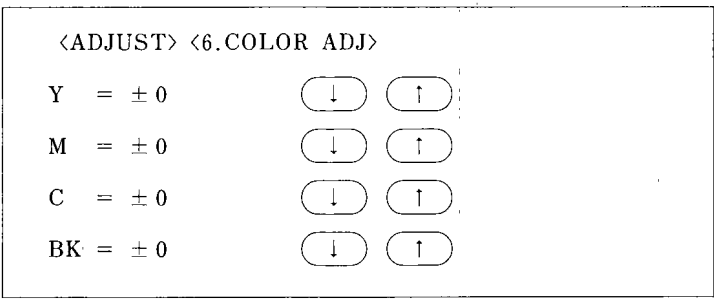
6. Color balance display



Screen 2-6 Color balance display

No.	Indication	Use	Range of settings
1	Y adjustment M adjustment C adjustment BK adjustment	The mode is for use by the servicemen. Set the median value for the color balance according to the needs of the user. • Positive values move the median value to DARKER. • Negative values move the median value to LIGHTER.	+4 ~ −4

Checks
1) Press the COLOR BALANCE key on the control panel.
2) Return the value for Y, M, C, and BK each to its median value (0).
3) Enter the service mode, and select <6. COLOR ADJ>.
4) Press the key for each color to adjust the color balance.

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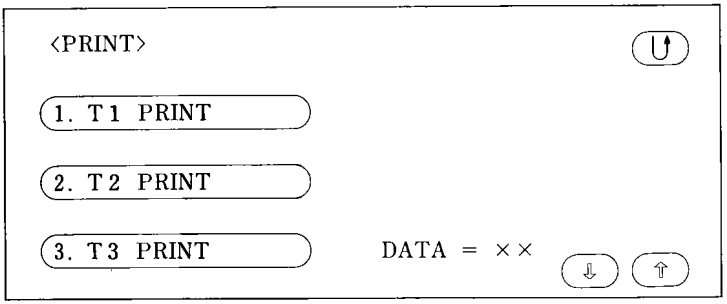
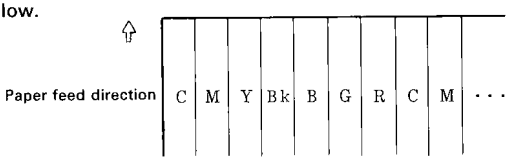
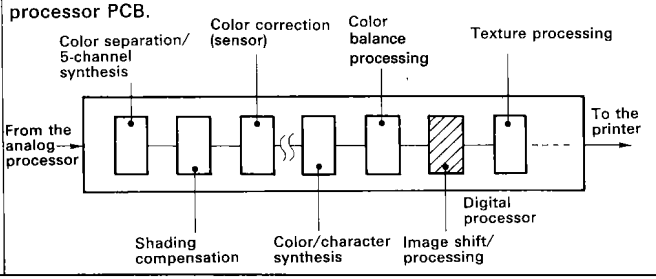
E. Test Print Mode



Screen 3 Test print

No.	Indication	Use
1	T1 PRINT	Press indication to output the test print of vertical stripes shown below.  This print data is generated by the color balance circuit of the digital processor PCB. 

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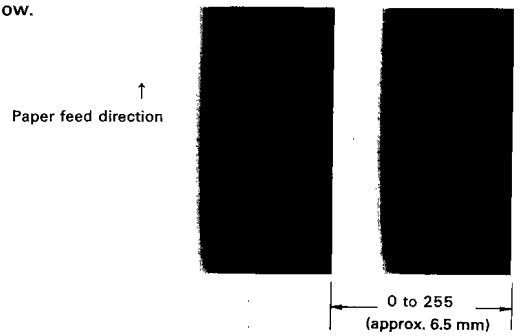
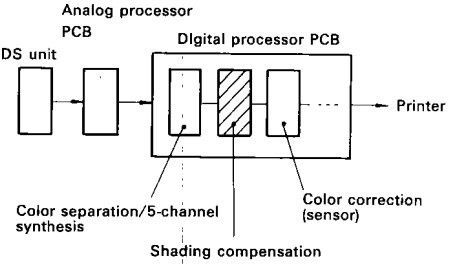
No.	Indication	Use
2	T2 PRINT	Press this indication to output the 256-gradation test print shown below.  The number of lines per gradation is 4 (approx. 0.25 mm). Print data are generated by the shading compensation circuit of the digital processor PCB.  **Note:** **When the one-, three-, or four-color mode is set up before starting the SERVICE mode, a 256-gradation test print in the selected color(s) is output.**
3	T3 PRINT	Press this indication to output an overall halftone test print. The halftone density can be changed by pressing ⇩ and ⇧. As with T1 PRINT, print data are generated by the color balance processing circuit of the digital processor PCB. **Note:** **When the one-, three-, or four-color mode is set up before starting the SERVICE mode, a halftone test print in the selected color(s) is output.**

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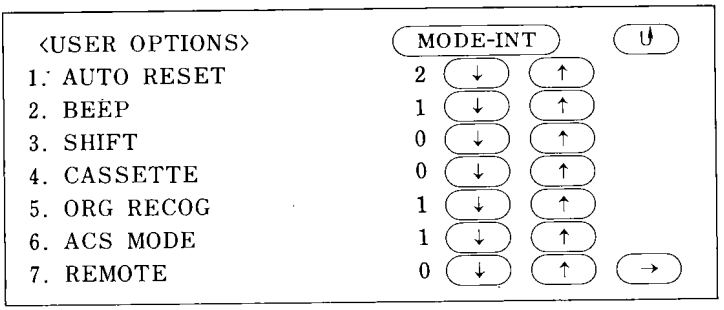
F. User options display



Screen 4-1 User options mode

No.	Indication	Use
1	RST TIME	Sets the time to return to the standard mode. It may be set to 0 through 9, on 1-min basis, and with the standard value being 2. (If '0', auto return is disabled.)
2	BEEP	0: Buzzer disabled.
3	SHIFT	Sets the standard modes. 0: Center 1: Corner (upper left) 2: Corner (lower left) 3: Corner (upper right) 4: Corner (lower right) 5: Manual 6: Binding (left) 7: Binding (right)
4	CASSETTE	Sets the standard modes. 0: Automatic 1: Upper holder 2: Lower holder
5	ORG RECOG	Sets the standard modes. 0: Document detection disabled. 1: Document detection enabled.
6	ACS MODE	Sets the standard modes. 0: ASC disabled. 1: ASC enabled.
7	REMOTE	Standard Mode Settings 0: remote disabled do not reset the CLC mode settings. 1: remote enabled do not reset the CLC mode settings. 2: remote disabled reset the CLC mode settings. 3: remote enabled reset the CLC mode settings.

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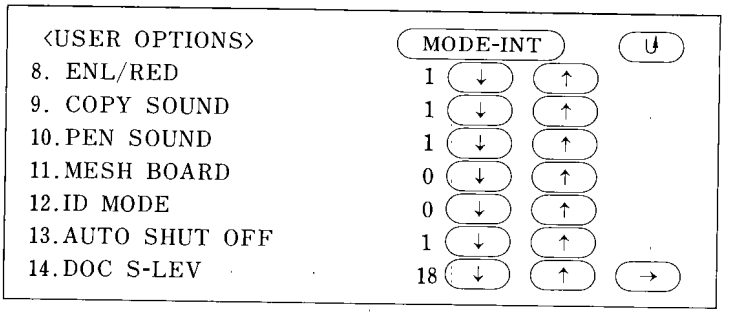

Screen 4-2 User options mode

No.	Indication	Use
8	ENL/RED	Changes the fixed reproduction ratios. 1: AB, 4R5E 2: INCH, 4R4E 3: A, 2R3E 4: AB/INCH, 4R5E **Note:** A, B, and INCH refer to units of measurement; 4R5E refers to REDUCE (fixed reproduction ratio) in 4 steps and EN-LARGE (fixed reproduction ratio) in 5 steps.
9	COPY SOUND	Enables or disables the buzzer sounded upon a press on the COPY START key. 0: Buzzer disabled. 1: B zzer enabled.
10	PEN SOUND	Enables or disables the buzzer sounded upon a press with the editor pen. 0: Buzzer disabled. 1: Buzzer enabled.
11	MESH BOARD	Not used.
12	ID. MODE	Enables or disabled indication of the pass mode screen on the message display upon power-on. 0: Display disabled. 1: Display enabled.
13	AUTO SHUT OFF	Enables or disables the auto shut-off mechanism. 0: Auto shut-off disabled. 1: Auto shut-off enabled in 2 hr.
14	DOC S-LEV	Adjusts the slice level for document detection (18, standard). The level may be 0 (white) through 31 (248-density); an increase, however, increases the sensitivity and leads to wrong detection. **Note:** Be sure to record the value after adjustment.

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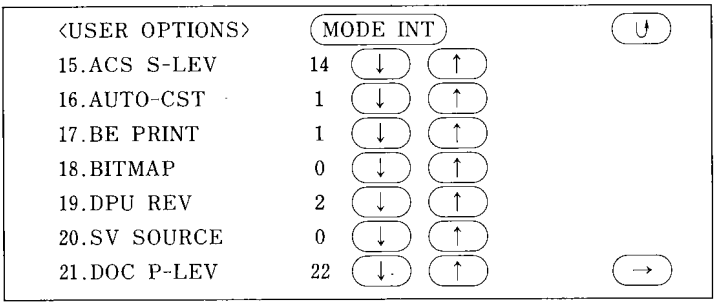

Screen 4-3 User options mode

No.	Indication	Use	Range of settings
15	ACS S-LEV	Adjusts the slice level for black document detection. The level may be 0 through 31 (14, standard); an increase, however, can lead to wrong detection, e.g., color identified as black.	
16	AUTO-CST	If enabled, the cassette holders are switched over automatically should the cassette in use run out of paper. 1: Auto cassette change disabled. 0: Auto cassette change enabled.	
17	BE PRINT	Changes the indications on the control panel (BE mode). 0: Display disabled. 1: Display as BE. 2: Display as BE in reverse.	
18	BIT MAP	Accommodates the bit memory PCB (text memory board TM32C). 0: Bit map memory PCB absent. 1: Bit map memory PCB present. Make sure it is '1' when the PCB is installed; otherwise, text composition at 400 DPI will remain disabled.	
19	DPU REV	Selects the digital processor PCB version. 0: Rev. 06 or earlier. 1: Revs. 07 through 09. 2: Rev. 10 or later. Make sure the version suits the PCB after replacement; otherwise, image processing will fail.	
20	SV SOURCE	Not used; keep it '0'.	
21	DOC P-LEV	Adjusts the slice level for the image projected by the projector. The level may be set to any value; a high level increases the sensitivity but, at the same time, may lead to wrong detection.	0 to 31 The standard value is 22.

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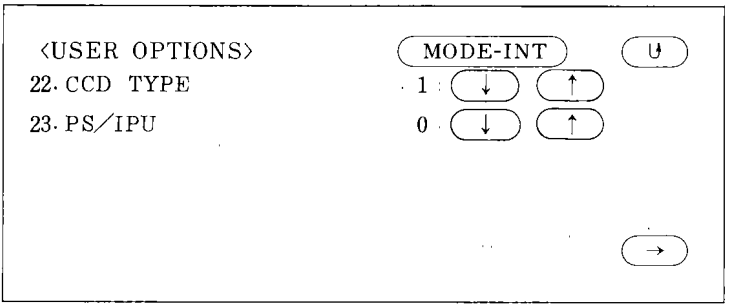

Screen 4-4 User options screen

No.	Indication	Use
22	CCD TYPE	Accommodates the CCD (light reception). 0: Set to this value if the new type CCD is used. 1: Set to this value if the old type CCD is used.
23	PS/IPU	when PS-IPU and IPU are installed. 0: when conneced to IPU. 1: when connected to PS-IPU.

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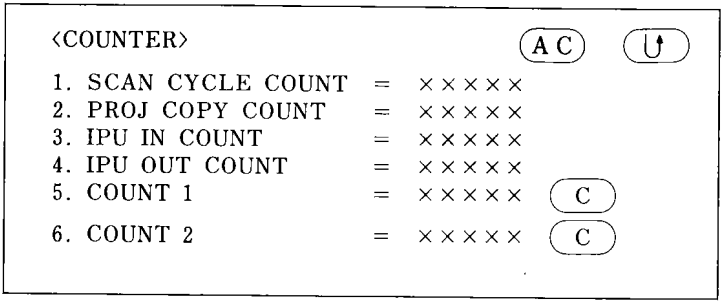
G. Counter Mode


‹COUNTER›
AC
1. SCAN CYCLE COUNT = XXXXX
2. PROJ COPY COUNT = XXXXX
3. IPU IN COUNT = XXXXX
4. IPU OUT COUNT = XXXXX
5. COUNT 1 = XXXXX C
6. COUNT 2 = XXXXX C

Screen 5 Counter

No.	Indication	Use	Counter range
1	SCAN CYCLE COUNT	Display shows total number of scanner operations since last reset. Unit = 1	0 to 65535
2	PROJ COPY COUNT	Display shows total number of copies made using projector since last reset. Unit = 1	0 to 65535
3		Resets the count of the selected setting to 0.	
4	IPU IN COUNT	Indicates the number of video transmissions from the scanner unit to the IPU. Unit: 1	
5	IPU OUT COUNT	Indicates the number of video transmissions from an external device to the scanner unit by way of the IPU. Unit: 1	0 to 65535
6	COUNT 1 COUNT 2	Counter for the serviceman; synchronized with counts of pick-ups. A press on the CLEAR key returns the reading to '0'. Unit = 1	0 to 65535

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H. ADJUSTMENT

1. After replacing the CPU PCB

1) Select the <ADJUST> SERVICE mode. Enter the settings again as explained on the label shown in Figure 2-97.
2) Perform the steps for parts replacement shown on page 2-67.
3) Ask the user for data regarding settings that had been entered into memory of the previous CPU PCB, and re-enter the data.

2. After replacing the scanning lamp or CCD pre-amplifier PCB.

1) Perform <LAMP ADJ> shown on page 2-75.
2) Perform <DOC B-LEV> shown on page 2-64.

3. After replacing the analog processor PCB, or digital processor PCB.

1) Perform the steps for parts replacement shown on page 2-67.

4. After replacing the lamp regulator

1) Perform <LAMP ADJ> shown on page 2-75.

5. After replacing the DS unit

1) Check and adjust the focusing shown on page 3-11.
2) Perform the steps for parts replacement shown on page 2-67.

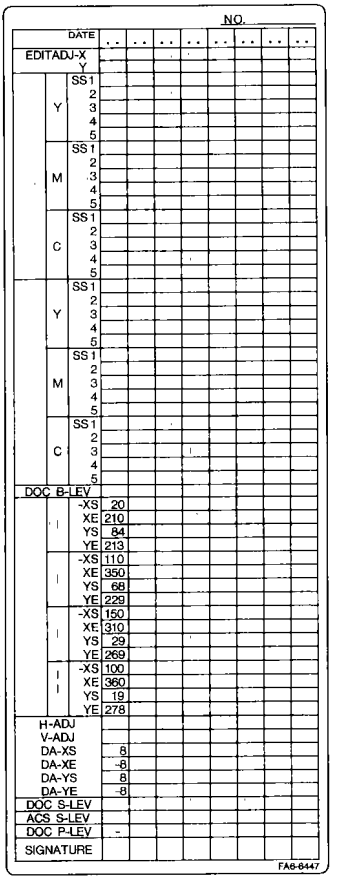

Figure 2-97 SERVICE mode label inside the left cover

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I. Standard Image

Make full-color (four-color) copies with the CANON CA-1 test sheet. Standard image copies should satisfy the following conditions of the gray scale, color patches, and 3-color gradation scale (on the test sheet).

1. Gray scale

Scale No. 1 (dark area) should be almost completely solid. The image should become lighter as the scale numbers increase. Scale No. 8 of the light area should be barely visible. Scale No. 9 should be blank.

Halftones should be almost gray, with no tinge of yellow, red, or blue.

2. Color patches

Colors should be distinguished from each another. Colors on the copy should not be much different from those on the test sheet.

3. Photograph

The color balance on the copy should not be much different from that on the original photograph.

4. Three-color gradation scale

All three colors should be close to the primary colors. The image density should decrease as the scale numbers increase. Scale No. 8 should be barely visible and scale No. 9 should be blank.

5. Gray scale stripe

Colors of the stripe on the copy should not be much different from those on the test sheet. The image should be even along the entire length of the stripe. Colors near the right and left edges should not differ very much.

No difference in density should be observed across the copy (five CCD blocks).

6. Fogging

The background color of the copy should not be much different from that of the test sheet.

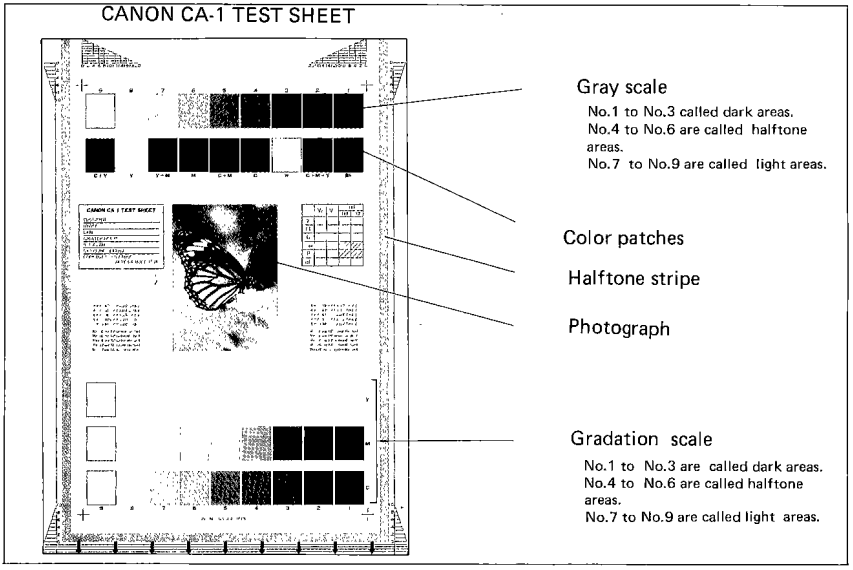
CANON CA-1 TEST SHEET
Gray scale
No.1 to No.3 called dark areas.
No.4 to No.6 are called halftone areas.
No.7 to No.9 are called light areas.
Color patches
Halftone stripe
Photograph
Gradation scale
No.1 to No.3 are called dark areas.
No.4 to No.6 are called halftone areas.
No.7 to No.9 are called light areas.

Figure 2-98

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J. Test Printing

1. Vertical stripe test print (T1)

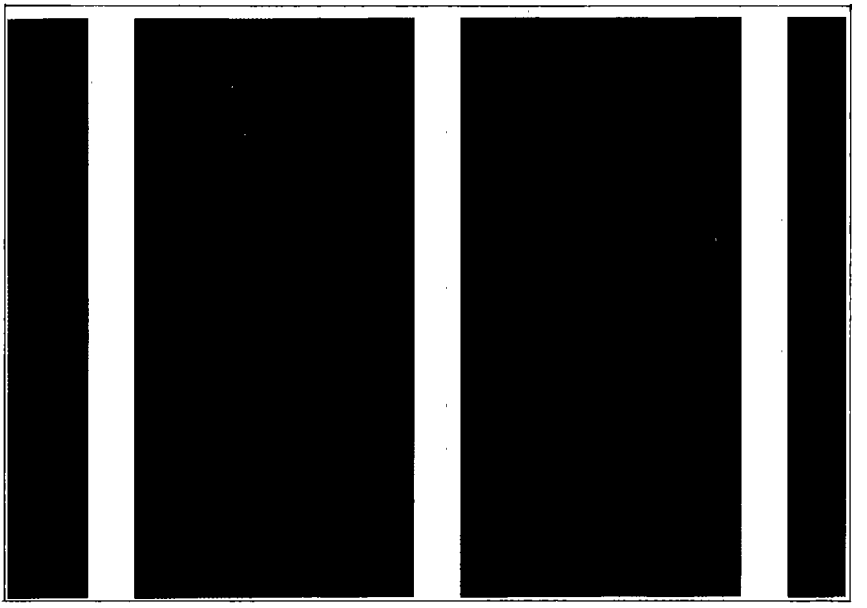

Figure 2-99

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2. 256-gradation test print (T2)

- Check of tone reproduction.

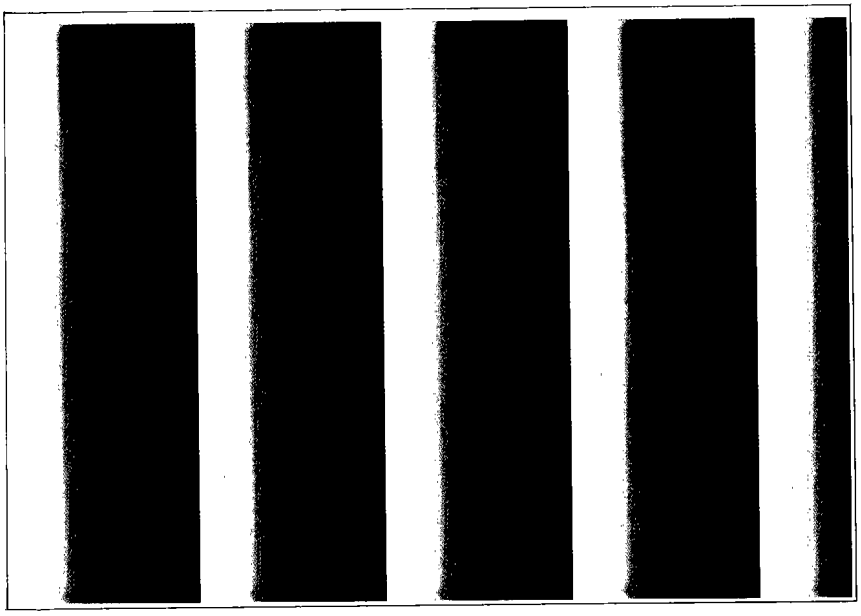

Figure 2-100

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3.Overall halftone test print (T3)

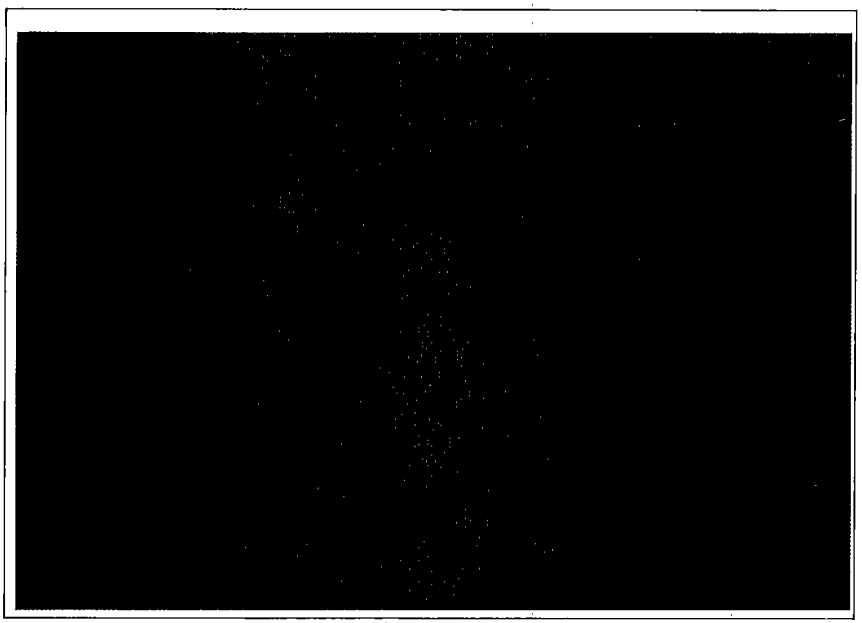

Figure 2-101

Reference:
Test print T2 is produced by the shading compensation circuit of the digital processor; test prints T1 and T3 produced by the color balance processing circuit.

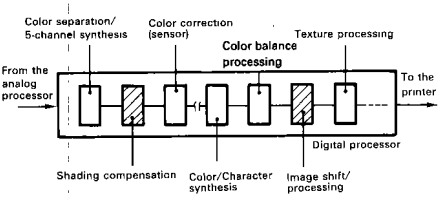

Figure 2-102

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VIII. SELF-DIAGNOSIS

A. Self-diagnosis Indications

The COLOR LASER COPIER has a self-diagnosis feature based on sensors, the CPU PCB, and the microcomputer of the DC controller PCB. If the self-diagnosis system detects an abnormality, the appropriate error code is displayed on the touch-panel display of the control panel and on the display PCB.

The table below lists the error codes, causes, and timing of tests.

Error code	Major causes	Condition(s) identifying problem	
E000	• Thermistor (TH1) open circuit or poor contact. • Broken fixing roller heater (H1, H2). • Defective AC driver PCB. • Defective DC controller PCB. • Defective triac.	L366 004	The connector of the thermistor is disconnected.
		005	The temperature of the fixing roller has exceeded 200°C.
		006	The temperature of the fixing roller fails to reach 50°C within 2 min after the power switch is turned ON.
E005	• Cleaning belt of fixing unit nearly used. • Defective remaining cleaning belt sensor (Q25). • Defective DC controller PCB.	• The thickness of the fixing unit cleaning belt on the take-up reel exceeds the allowable limit.	
E010	• Defective drum motor. • Defective motor driver PCB. • Defective DC controller PCB.	• Clock pulses are not being generated within 0.2 second after the drum motor starts rotating and the first TRANSFER DRUM HOME POSITION SENSOR signal is output. • The specified number of clock pulses is not output for one rotation of the transfer drum.	
E012	• Faulty main motor. • Defective DC driver PCB. • Defective DC controller PCB.	• The speed of the main motor was not of the specified range for 2 seconds or more.	

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Error code	Major causes		Condition(s) identifying problem	
E020	Low intensity because of defective toner concentration detection lamp or filter optical fiber	L330 (M)	001	Reading for address L260, L261, L262 or L263 is lower than required (about 0.3).
	Low intensity because of defective toner concentration detection lamp or filter	L331 (C)	002	Reading for address L260, L261, L262, L263 is higher than required (about 3.5).
	Defective filter switching solenoid	L332 (Y) L333 (BK)	003	Reading for addresses L260 and L264, L261 and L265, L262 and L266, or L263 and L267 were indentical four times or more in succession.
	Defective toner concentration detection lamp or optical fiber		004	Reading for address L260 is less than half that for L244 (likewise for L261/L245, L262/L246, L263/L247).
	Inadequate M toner supply because of excessive M development		005	Toner concentration does not reach the required value even after 20 or more toner-replenishing rotations of the transfer drum. (A4, 3-color)
	Damaged toner supply screw or toner supply clutch		006	Reading for address L254 is less than that for L240 (likewise for L255/L241, L256/242, L257/L243) for move than 30 copies in succession.
	Defective toner concentration filter or optical fiber		008	The difference between the highest and lowest measurements obtained by P135 (service mode) during density adjustment is about 0.3 V or more.

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Error code	Major causes	Condition(s) identifying problem	
E021	• Defective turret motor (M4). • Defective turret motor controller PCB. • Defective turret motor driver PCB. • Defective transistor unit. • Defective DC controller PCB. • Over-load on main motor.	L335 001	The turret lock release sensor (Q12) fails to detect lock release.
		002	The PEND signal fails to go '1'. (The turret operation end signal is not generated.)
		003	The PEND signal fails to go '0'. (The turret operation end signal persists.)
		004	The turret lock release sensor (Q12) fails to detect locking.
		005	The turret home position signal is not generated within 20 sec.
		006	The END signal fails to go '0'. (The turret operation end signal is not generated.)
		008	An over-current is detected.
E030	• Discontinuity in coil circuit of counter. • Defective DC controller PCB. • Defective DC driver PCB.	• Counter does not operate when it should.	
E040	• Defective cassette paper lifter clutch. • Defective DC driver PCB. • Defective DC controller PCB.	• CASSETTE LIFTER POSITION SENSOR signal is not generated within 10 sec after the CASSETTE PAPER LIFTER CLUTCH DRIVE command was output.	

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Error code	Major causes	Condition(s) identifying problem	
E061	• Defective drum surface potential measuring unit. • Defective drum surface potential controller PCB. • Defective primary corona unit. • Defective HVT-DC2. • Defective HVT-DC4. • Defective DC controller PCB. • Defective environment measuring PCB. • Defective laser unit. • Defective pre-exposure lamp.	L334	The difference between V_{D1} and V_{D2} is 50 V or less.
		001	
		002	The values of V_{D1} and V_{D2} or V_{L1} and V_{L2} are approximates.
		003	The values of V_{D2} and V_{D3} or V_{L2} and V_{L3} are approximates.
		007	The upper limiter of the grid bias is activated.
		008	The upper limiter of the developing bias is activated.
		009	The values of V_{D1}, V_{D2}, and V_{D3} are all 20 V or less. (mainly, primary corona output failure)
		010	The value of V_{D1} is 600 V or more; or the difference between V_{D1} and V_{D2} is 70 V or less. (mainly pre-exposure lamp failure)
		011	The values of V_{D1}, V_{D2}, and V_{D3} are all 100 V or less. (mainly, grid bias output failure)
		012	The values of V_{D1}, V_{D2}, and V_{D3} are all 900 V or more. (mainly, broken grid wire)
		013	The difference between V_{D1} and V_{L1}, between V_{D2} and V_{L2}, or V_{D3} and V_{L3} is 100 V or less. (mainly, laser beam insufficiency)
E070	• Defective drum motor • Defective motor driver PCB • Defective drum home position sensor (Q16) • Defective DC controller PCB • Defective transfer drum	• The transfer drum home position detect signal is not generated within 6 sec after the drum motor starts to rotate. • The intervals of the transfer drum home position detect signal while the drum motor rotates are 6 sec or more.	
E071	• Defective image leading edge sensor (Q15) • Defective DC controller PCB	• The image leading edge detect signal is not generated while the drum motor rotates between two transfer drum home position detect signals.	

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Error code	Major causes	Condition(s) identifying problem	
E072	• Defective gripper motor. • Defective separation motor • Defective paper guide motor • Defective push-up sheet position sensor • Defective separation claw home position sensor • Defective paper guide home position sensor • Defective transfer driver PCB • Defective DC controller PCB	L337 001	The push-up sheet position signal fails to go from '0', to '1', and then to '0' at power-on.
		002	The separation claw home position signal fails to go '1' at power-on.
		003	The paper guide home position signal fails to go '1' at power-on.
E100	• Wrong laser folding mirror position • Defective laser unit • Defective optical fiber • Defective DC controller PB	• The BD signal cycles have a discrepancy of 2 sec or more.	
E101	• Defective AF sensor PCB • Defective AF motor • Defective transfer driver PCB • Defective transfer driver PCB • Defective DC controller PCB	L340 001	The correction lens home position fails to go '1' at power-on.
		002	The timing signal (AFT) for AF data transmission is not received in AF mode.
E110	• Defective laser scanner motor • Defective laser scanner motor driver PCB • Defective DC controller	• The laser scanner motor fails to reach the specified speed within 60 sec after power-on.	
E120	• Defective laser unit • Defective DC driver PCB • Defective DC controller PCB	• Laser unit has not reached the specified temperature within 60 sec after the power is switched ON.	
E205	• Defective scanner motor • Defective scanner travel limit sensor (left or right) • Defective scanner motor controller PCB • Defective CPU PCB • Defective power supply to the scanner motor controller PCB	• The scanner is not at its HOME position within 6 sec after the power is switched ON and the CPU outputs the return to HOME POSITION command. • The scanner travel limit sensor (left or right) detects the scanner at the following times: 1. In STANDBY, 2. When signal PSYNC is received from the printer, 3. After a scanning operation during copying. • There is a communication error between the CPU PCB and the scanner motor controller PCB.	

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Error code	Major causes	Condition(s) identifying problem
E302	• Defective scanning lamp • Defective standard white sheet • Defective CCD • Defective CCD pre-amplifier PCB • Defective CCD driver PCB • Defective analog processor PCB • Defective digital processor PCB • Defective wiring	• The density level is smaller (darker) than the standard value when measuring the standard white sheet after the COPY START key is pressed. If SERVICE mode has been selected even once after scanner power is turned ON, E302 will not be detected from that time onward.
E350	• Bar code label (faulty or not attached) • Digital processor PCB (faulty) • CPU PCB (faulty) • ECO processor PCB (faulty)	• The bar code label is not detected during the first copying operation after power-on.
E351	• Digital processor PCB (faulty) • ECO processor PCB (faulty) • CPU PCB (faulty)	• The ECO processor PCB and the digital processor PCB are not connected. • The ROM on the ECO processor PCB is not of a correct type.
E352	• Bar code label (faulty or not attached) • Digital processor PCB (faulty) • CPU PCB (faulty) • ECO processor PCB (faulty)	• The bar code cannot be read when 'DOC B-LEV' is executeed in service mode.
E353	• White density calibration plate (faulty) • Blank paper (faulty)	• Damage or dirt is found on the white density calibration plate when 'DOC B-LEV' is executed in service mode. • The density of the blank paper set on the copyboard is too high when executing 'DOC B-LEV' is executed in service mode.
E620	• Defective editor controller PCB • Defective CPU PCB	• A communication error between the CPU PCB and the editor controller PCB has occurred.
E633	• Film projector controller PCB (failure) • CPU PCB (failure)	• The communication between the film projector and CPU PCB fails for 5 sec or more.
E634	• Projector lamp (failure)	• See the PROJECTOR SERVICE MANUAL.
E640 (See the IPU MANUAL.)	• IPU 30D • CPU PCB	• A communication error exists between the CPU PCB and IPU. • A problem exists in the IPU. • See Reference.
E650 (See the FILM SCANNER MANUAL.)	• Defective film scanner • Defective CPU PCB	• A communication error between the CPU PCB and film scanner. • A problem inside the film scanner.
E700	• Defective printer DC controller PCB • Defective CPU PCB	• A communication error between the CPU PCB and the DC controller PCB has occurred.

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Reference:

1. When an error is detected by the self-diagnosis system, the machine can be reset by setting the power switch OFF briefly, then ON again, except when E000 is displayed to indicate a broken thermistor. (This prevents the user from damaging the fixing roller by restarting the machine and causing the roller to overheat.)

   E000 is reset using the printer SERVICE mode, as follows:

   1) Set the SERVICE mode and enter [*] [4] [*] [*] [2] [0] [0] [*] on the printer display PCB.
   2) Press [1] [*]. (This cancels E000.)
   3) Press the [C] key twice.
   4) Set the power switch OFF then ON.

2. The copying machine checks the type of option connected to it at power-on. Should a communication problem occur and detection of the option fail, 'E640' is indicated.
3. The machine is not equipped with a mechanism to check the IC card unit for problems; as such, the message 'CARD NOT ACCEPTED' is displayed in response to any problem in the IC card or the IC card unit alike.

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B. Printer Warning Indications

The CPU PCB and the DC controller microprocessor of the printer have error detection functions, especially to determine whether the sensors are effective. As soon as an abnormal condition is found, an error code is displayed by the LED indicators on the display PCB.

Remarks:
If the document scanner and printer are connected, these error codes are transmitted to the document scanner and displayed on the control panel LCD display, but they are not displayed if the printer and document scanner are disconnected and printer operation is checked; the LED indicators on the display PCB of the printer show any error codes.

The error codes are also displayed on the 7-segment displays on the display PCB.

Code	Reason for indication	Remarks
	No copy paper or no cassette	
	Waste toner above specified level	
	Door is open	
	Warm-up	
	No silicone oil for fixing assembly	
	No control key	
	No magenta toner	
	No cyan toner	
	No yellow toner	
	No black toner	
	Wrong print	
	Warns of an error that occurs during copy operation; the applicable code will be indicated when the copy operation is complete.	
	Paper jam in upper cassette	
	Paper jam in lower cassette	
	Registration roller paper jam	
	Transfer drum paper jam	

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Code	Reason for indication	Remarks
J34	Separation unit paper jam	
J35	Delivery unit delay jam	
J36	Delivery unit stationary jam	

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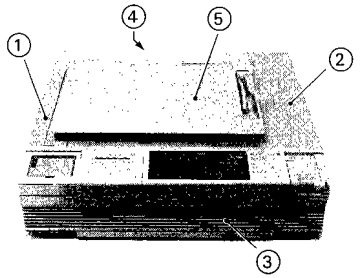
I. EXTERNALS

A. External Covers/Panels



① Left cover (4)
② Right cover (5)
③ Front cover (2)
④ Rear cover (4)
⑤ Editor

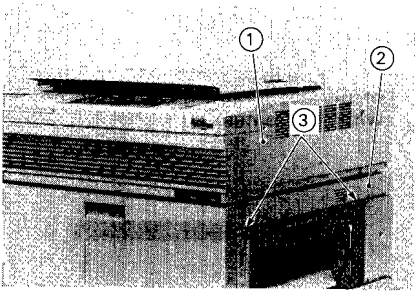
Figure 3-1

Note:
Figures in parentheses ( ) indicate the number of screws.

In the following, the procedure for removing covers and panels is omitted if they can be removed by simply removing screws.

1. Removing the Copyboard Glass

1) Open the delivery unit.
2) Remove two mounting screws and slide the image scanner unit to the right together with the top cover.



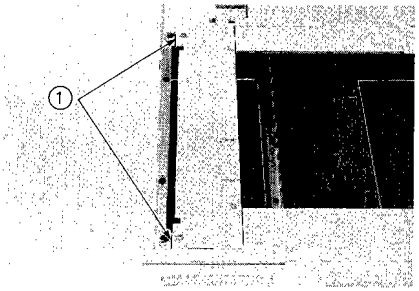
① Image scanner
② Top cover (printer)
③ Screws

Figure 3-2

3) Remove the left cover.

Note:
Be careful not to drop screws onto the PCBs.

4) Open the editor fully.
5) Remove two screws and detach the copyboard glass retainer (right).
6) Scribe along the left edge of the copyboard glass retainer (left) to mark its position.



① Scribed lines

Figure 3-3

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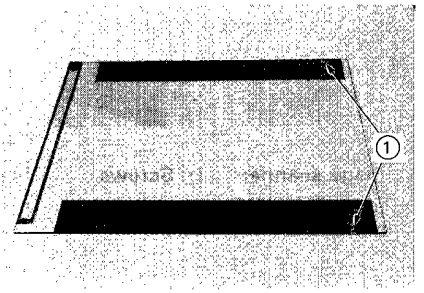
7) Remove two screws and detach the copyboard glass retainer (left).
8) Remove the copyboard glass.

2. Installing the Copyboard Glass

1) Place the copyboard glass with its edge firmly against the glass retainer at the front of the image scanner, making sure that two grounding plates at the right of the copyboard glass are in contact with the frames.



① Grounding plates

Figure 3-4

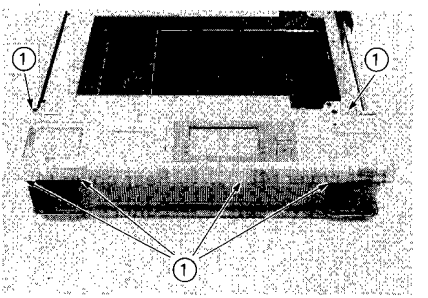
2) Install the copyboard glass retainer (left) along the scribed line.
3) Press the copyboard glass leftward (toward the copyboard glass retainer (left).
4) Install the copyboard glass retainer (right) and the left cover.
5) Fix the top cover of the printer in place. Replace the two screws shown in Figure 3-2.

Note:
Take care not to soil or damage the bar code label attached behind the copyboard glass retainer (left).

B. Control Panel Unit

1. Removing the Control Panel Unit

1) Remove the left cover.
2) Remove the right cover.
3) Remove two mounting screws and detach the front cover.
4) Remove six mounting screws, two grounding wires, and three cables, and detach the control panel unit.

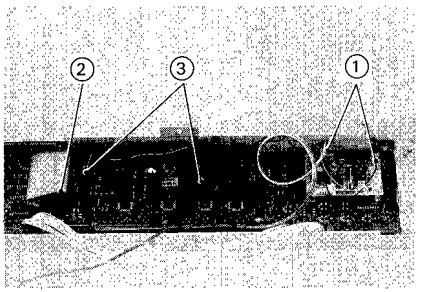


① Screws

Figure 3-5

2. Removing the LCD (liquid crystal display) Unit

1) Remove the control panel unit.
2) Remove six mounting screws, connectors, two grounding wires and harness, and detach the LCD unit.



① Connectors
② Harness
③ Grounding wires

Figure 3-6

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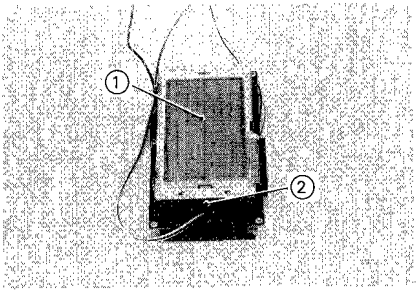
3. Replacing the LCD Illumination Lamp

1) Remove the LCD unit.
2) Pull out the lamp.

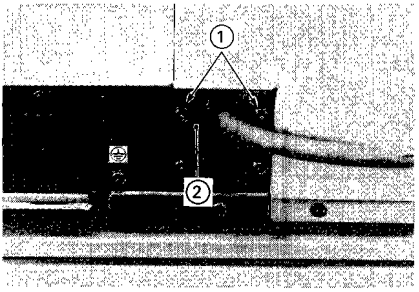


① LCD unit ② Lamp

Figure 3-7

C. Removing the Editor

1) Remove two mounting screws and detach the editor cable support plate.



① Mounting screws ② Support plate

Figure 3-8

2) Remove two connectors and detach the editor.

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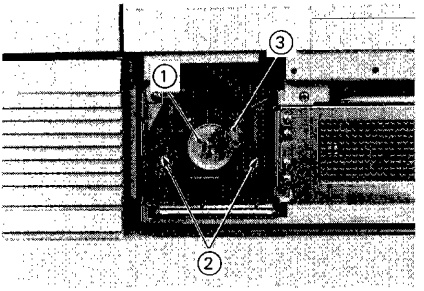
D. Fans

1) Remove the front cover.
2) Remove two mounting screws and one connector, and pull the fan off.



① Fan motor unit ③ Connector (M2)
② Mounting screws

Figure 3-9

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II. DRIVE SYSTEM

A. Scanner Drive Assembly

1. Installing the DS Unit Drive Cables

1) Remove the front mounting plate for the right cover.
2) Attach the cable mounting plate to the cover mounting plate using one screw, as shown in Figure 3-10.

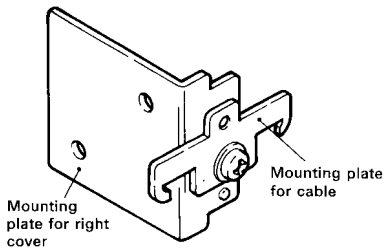

Figure 3-10

3) Put a cable in the groove of the front capstan with the bead in the recess and the short end of the cable toward the side marked 'A' in Figure 3-12.
4) Push the front capstan outward, then tighten the setscrews of the capstan.
5) If the other cable has been fitted already, loosen the setscrew used to fix the pulley in place.
6) Wind the shorter end of the cable 5.5 turns clockwise around the capstan toward the inside of the image scanner, pass the end of the cable through the hole in the right plate, and hook the ring on one hook of the cable mounting plate (shown in Figure 3-10).

Notes:
1. The cover mounting plate prevents the cable mounting plate from being pulled back through the hole in the plate.
2. Put the ring on the hook as shown in Figure 3-11.

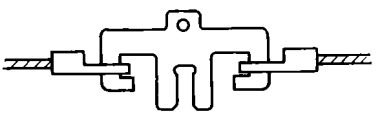

Figure 3-11

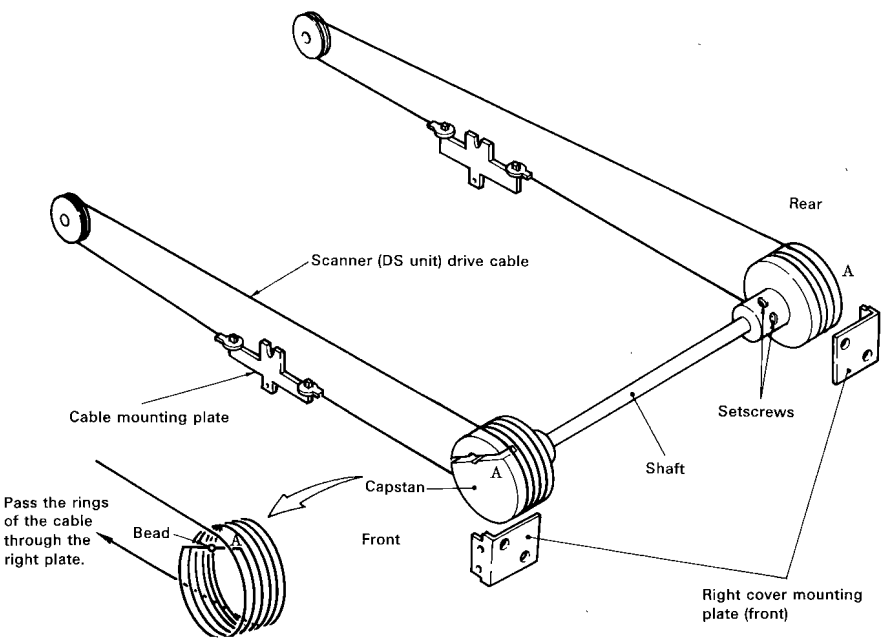

Figure 3-12

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7) Wind the longer end of the cable 1 turn counterclockwise away from the inside of the image scanner, pass it around the idler pulley, and hook the ring on the other hook of the cable mounting plate.
8) Move the cable mounting plate back and forth to confirm that the capstan and pulley turn smoothly.
9) Remove the right cover plate from the cable hook plate, and mount the right cover plate back into its original position.
10) Mount the cable hook plate on the DS unit.

If the other setscrew has been loosened in step 5),

11) Tighten the setscrew.
12) Follow the procedure of "Adjusting squareness."

2. Adjusting Squareness

1) Move the DS unit fully to the left. Install the copyboard glass with its front edge firmly to the front.
2) Loosen the two setscrews fastening the rear capstan to the shaft.
3) By turning the rear capstan, move the rear end of the DS unit so that the outer edge of the fiber optic lens array is parallel to the end of the copyboard glass. (Look straight down and align it by eye.)
4) Tighten the setscrews of the capstan carefully so that the lens array stays in alignment.

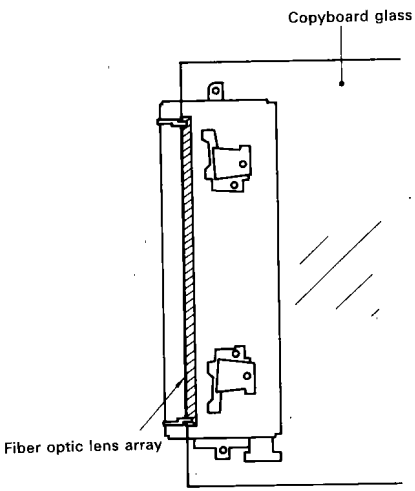

Figure 3-13

5) Make one black, magenta or cyan single-color copy of a test chart.
6) Put the copy over the test chart so that point A and the vertical line shown in Figure 3-14 are aligned.
7) Check that the test chart and the copy match within 1 mm at point B.

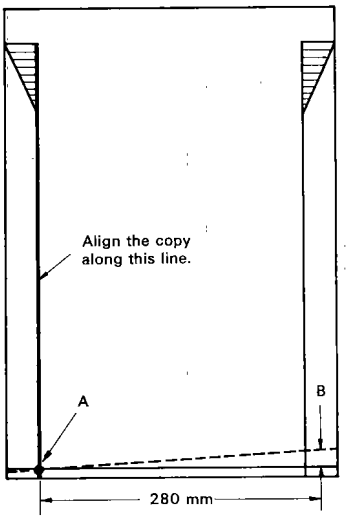

Figure 3-14

- If the error is 1 mm or more, loosen the setscrews and repeat the adjustment.

8) Install the copyboard glass retainer and covers.

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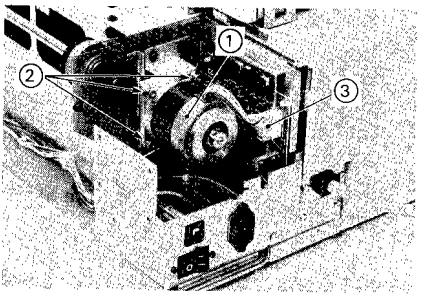
3. Removing the Scanner Motor (M1)

1) Remove the right cover.
2) Disconnect J603 of the scanner motor controller PCB.
3) Remove four screws and detach the scanner motor.



① Scanner motor (M1)
② Screws
③ J603

Figure 3-15

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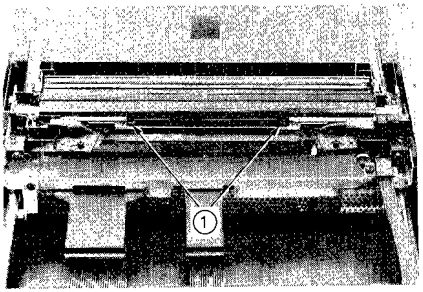
III. EXPOSURE SYSTEM

A. Scanning Lamp Unit

1. Removing the Scanning Lamp and Thermoswitch

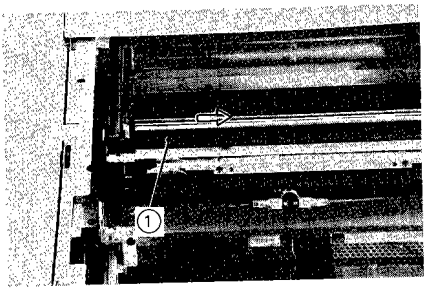
1) Unplug the power cord.
2) Remove the copyboard glass.
3) Remove two screws and detach the light blocking plate.



① Screws

Figure 3-16

4) Remove the scanning lamp by pressing it gently toward the rear of the machine.



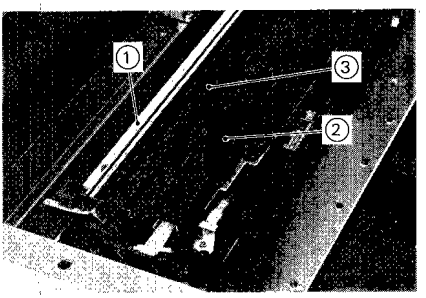
① Scanning lamp

Figure 3-17

Notes:
1. Do not do this while the scanning lamp is still hot.
2. Do not touch the scanning lamp with bare hands.
3. If skin oil or other material is on the lamp, clean it thoroughly with a dry cloth. Use a solvent if necessary to remove all oils.

2. Cleaning the Reflector and the Fiber Optic Lens Array

1) Remove the scanning lamp. See above notes.
2) Clean all reflectors and the lens array with a blower brush.



① Left reflector
② Reflector
③ Fiber optic lens array

Figure 3-18

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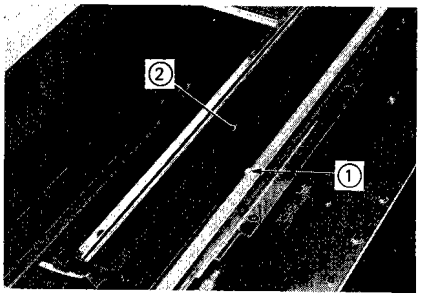
3. Installing the Scanning Lamp

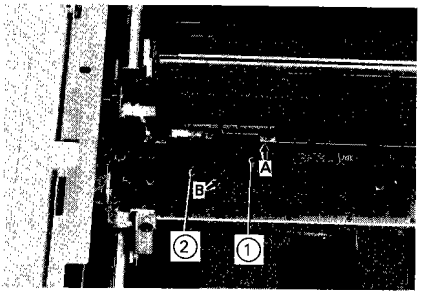
Install the scanning lamp so that the projection on its surface faces the lens array.



① Projection ② Fiber optic lens array

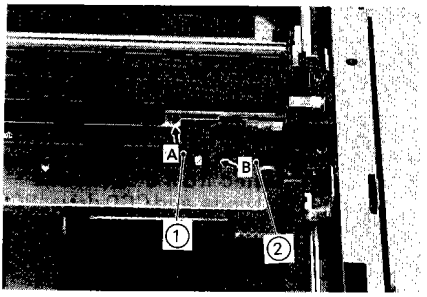
Figure 3-19

4. Positioning the Side Reflector



① Lower adjustment plate ② Upper adjustment plate

Figure 3-20 (front)



① Lower adjustment plate ② Upper adjustment plate

Figure 3-21 (rear)

If, after the scanning lamp has been replaced, the density along either edge of a copy is different from that of the central areas of the copy, first clean all optical surfaces. If this does not solve the problem, reposition the lower adjustment plate of the side reflector.

If the density of a copy of a test sheet of constant density varies in the way shown in Figure 3-22, move the lower adjustment plate in the direction shown by arrow A in Figure 3-21.

If the density of a copy varies in the way shown in Figure 3-23 after the above adjustment, move the upper adjustment plate in the direction shown by arrow B in Figure 3-21 to even the light distribution.

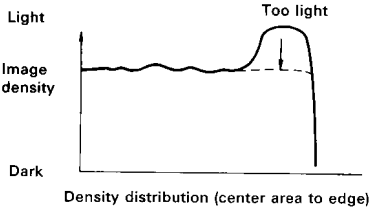


Figure 3-22

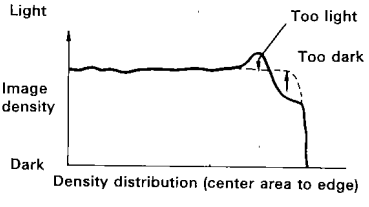


Figure 3-23

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B. DS Unit (document scanner unit)

1. Outline

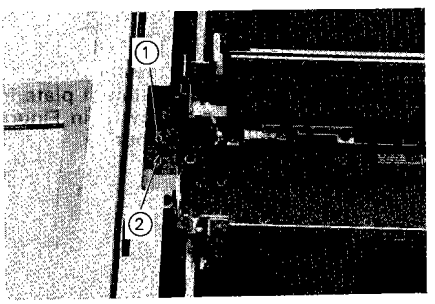
The DS unit consists of the CCD units, CCD driver PCB, CCD preamplifier PCB, scanning lamp, and fiber optic lens array. The CCD unit produces a signal representing the linear pattern of light and dark areas in the light reflected from a document.

The lens, CCD units, and CCD driver PCB require precise adjustment that is possible only at the factory. If any part becomes faulty, replace the entire DS unit.

Note:
After replacing the DS unit, check the focusing and make the adjustment described on page 2-81.

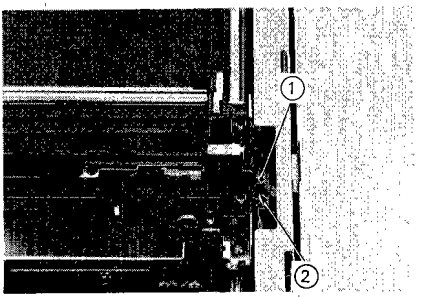
2. Disassembly and Assembly

1) Remove the copyboard glass.
2) Move the DS unit to the center position.
3) Loosen the two screws fastening the cable mounting plates to the DS unit. Lift the DS unit off the rails and out of the image scanner, and place it upside down.



① Cable mounting plate ② Screw

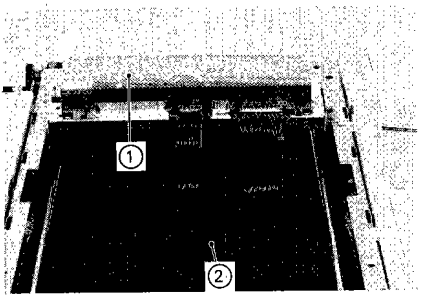
Figure 3-24 (front)



① Cable mounting plate ② Screw

Figure 3-25 (rear)

4) Remove four screws and detach the cover of the DS unit.
5) Remove five screws and remove the silver cover.



① DS unit cover ② Silver cover

Figure 3-26

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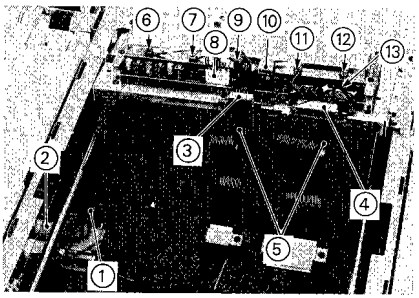
6) Remove one screw and detach cable clamp A.
   Disconnect the connector to separate the cable from the image scanner.
7) Remove four screws and detach cable clamps B, C and two leaf springs.
8) Disconnect the nine connectors (J106 to J111, J201 and J202), then remove the DS unit.



① Cable clamp A
② Connector
③ Cable clamp B
④ Cable clamp C
⑤ Leaf spring
⑥ J106
⑦ J107
⑧ J202
⑨ J108
⑩ J111
⑪ J109
⑫ J110
⑬ J201

Figure 3-27

Note:
After installing the DS unit, move the unit carefully by hand to make sure that no cables are caught.

3. Focusing Adjustment for DS Unit

As shown in Figure 3-28, focusing adjustment is done with a thumbscrew. Turning the thumbscrew changes the height of plate A together with the lens array.

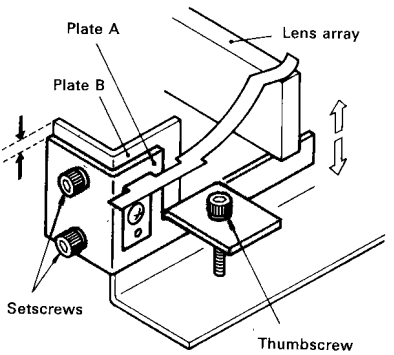


Figure 3-28

Note:
Prepare for the adjustment as follows:
a) By making half-tone test prints with the printer, confirm that there is no unevenness in density.
b) Confirm that the copyboard cover positively contacts the document.
c) Confirm that the document positively contacts the copyboard glass.
d) Confirm that there is no dirt or foreign matter on the copyboard glass surface.
e) Confirm that there is no dirt or foreign matter on the lens array top surface.
f) Confirm that the position of the copyboard glass is correct.
g) Confirm that there is no foreign matter on the DS unit rail and DS unit slider.

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Procedure:

1) Place the NA-2 (NB-3) test sheet on the copyboard glass.
2) Select one of the uniform tone mono-colors for making prints. For ease in adjustment, choose magenta, cyan, or black mono-color.
3) Make one print.
4) Raise the copyboard cover and make one print while applying a moderately strong pressure from above the test chart with your hand.

Note:
At this time, there is a slight sag of the copyboard glass and the distance between the test chart and the lens decreases.

5) Turn OFF the power and remove the left cover, both left and right copyboard glass retainers, and the copyboard glass.
6) Before going onto step 7), measure the difference in height between plates A and B shown in the Figure 3-28.
7) Remove one of the four setscrews with its washer and remove the adhesives from the setscrew and its washer. Put back the setscrew and washer but do not yet fully tighten them. Go through the process separately (no particular order) for the remaining three setscrews and washers.
8) Push down plate A and confirm that the lens array can move up and down.
9) If the image of the print made in step 4) suffers more from the lack of sharpness compared to the print made in step 3), turn the thumbscrew clockwise about a half turn. As a result, the height of the lens decreases.
   If the image of the print made in step 4), on the contrary, suffers less from the lack of sharpness compared to the print made in step 3), turn the thumbscrew counterclockwise about a half turn. As a result, the height of the lens increases.
10) Fully tighten the setscrews and reinstall the copyboard glass and the copyboard glass retainers.
11) Turn ON the power and repeat steps 1) to 10) until the prints produce sharp images.

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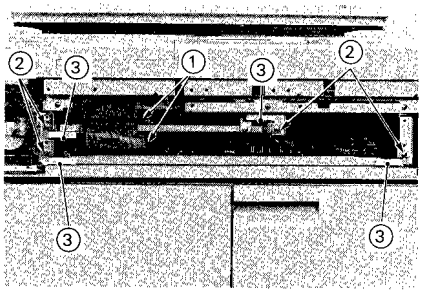
IV. ELECTRICAL

A. Detaching the PCBs

1. Detaching the CPU PCB, Analog Processor PCB, and Digital Processor PCB

1) Remove the front panel.
2) Remove the six mounting screws, and remove the PCB unit front cover.
3) Remove the two connectors.
4) Remove the four screws.
5) Pull the lever toward the front, and pull the PCB to be removed toward the front.

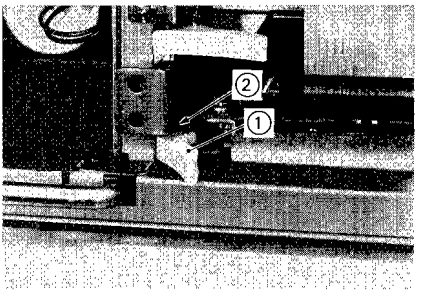


① Connectors ③ Levers
② Screws

Figure 3-29

Note:
The analog processor PCB has five cords from the DS unit connected to it; take care in detaching it and disconnecting the cords.

Note:
1. Make the adjustments described on page 2-81 when the CPU PCB, analog processor PCB, or digital processor PCB has been replaced.
2. Check that the levers are properly in the holes when installing the PCBs.



① Lever ② Hole

Figure 3-30

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I. INSTALLATION SUGGESTIONS

It is suggested that a serviceman personally visit the customer's premises before installing the image scanner unit. The location should meet the following requirements.

(1) The operating temperature should be in the range 15° to 30°C (59°F to 86°F) and relative humidity in the range 10% to 80%. (See Figure 5-1 in the PRINTER SERVICE MANUAL for details.) Installation near water faucets, humidifiers, air conditioning outlets, and refrigerators should be avoided.
(2) The image scanner unit should not be exposed to open flames, dust, ammonia fumes, or direct sunlight. A heavy curtain can be put up to protect the copying machine if it must be installed in a location receiving direct sunlight.
(3) The room should be well ventilated.
(4) The image scanner unit should be installed level on a sturdy support, such as a pedestal or desk, with all feet in firm contact.
(5) The image scanner unit should be located at least 10 cm (4") from the wall behind it, and there should be sufficient space to permit unimpeded operation.

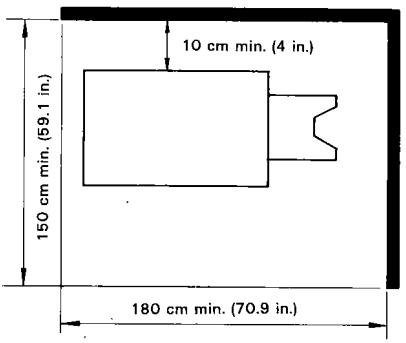

Figure 4-1

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II. UNPACKING AND INSTALLATION

1. Bringing a machine from storage in a cold area into a warm room can cause condensation on the metal and glass parts, which will adversely affect printer performance. In such conditions, move the packing crate into the warm room and leave it unopened for at least one hour to allow the machine to warm up.
2. First unpack the printer unit, then unpack the image scanner unit. (See PRINTER SERVICE MANUAL CHAPTER 5 for details on printer installation.)

Step	Work	Checks	Remarks
1	Unpack the image scanner unit and remove all tape from the exterior.		
2	Place the image scanner unit on top of the printer.	Check that the components and accessories listed below are present. • Operator's Manual • Image scanner unit connector cable • Power cord • Mirror unit positioning plate	• White density calibration plate (CLC 550 only)
3	Move the scanner to the right and remove the left cover of the scanner.		
4	Remove the locking plates at the left of the document scanner (DS) unit.		See Figure 4-2. Keep the plates for future use in transportation.
5	Mount the left cover, and fix the image scanner unit in place.	Tear off the protective plastic film from the index plates.	See Figure 4-3.
6	Attach the image scanner connector cable.		
7	Plug the scanner power cord into the outlet in the printer. **Note:** **Ensure that the power switch is OFF.**		
8	Put the white density calibration plate in an aluminum coated plastic bag, and attach it behind the front left door of the printer unit.	CLC550 only.	
9	Beyond this point, follow the printer installation procedure. (See PRINTER MANUAL CHAPTER 5.)		

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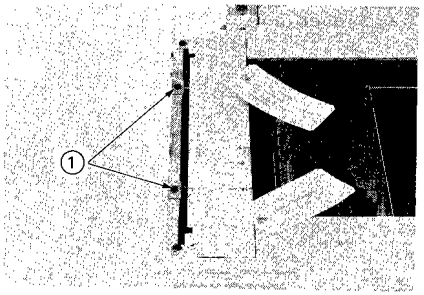

① Locking plates

Figure 4-2

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III. MOVING THE IMAGE SCANNER

The following steps should be taken if the image scanner unit has to be transported to another location by truck, etc., after having been installed.

Step	Work	Remarks
1.	Disconnect the image scanner connection cable.	
2.	Remove the copyboard glass, and attach the locking plates at the left of the DS unit.	See Figure 4-2.
3.	Attach the copyboard glass.	
4.	Secure the image editing unit with tape.	
5.	Place the image scanner unit in its box.	

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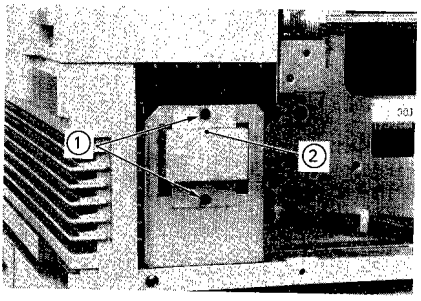
IV. ATTACHING CONTROL COUNTER II AND CONTROL CARD III UNIT SOCKET

1) Remove the right cover.
2) Remove the two mounting screws, and take off the cover plate.



① Screws ② Cover plate

Figure 4-3

3) Disconnect the connector for J36 (4P) shown in Figure 5-5.

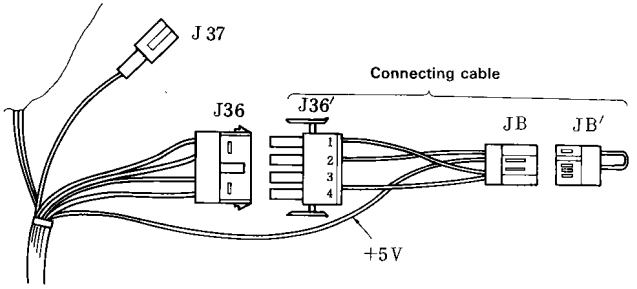


Figure 4-4

4) Connect the two connectors of the leads of the socket for the control counter/control card unit to the four-pin and one-pin connectors shown in Figure 4-4.
5) Attach the socket using the two countersunk screws.

Note:
The arrow on the panel should point upward.

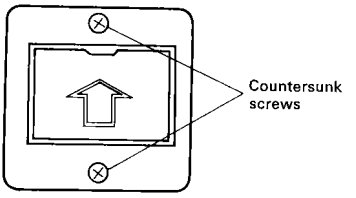


Figure 4-5

6) Reattach the right cover.
7) Insert the control counter II or the control card III unit. Check copying machine and counter/control card operation.

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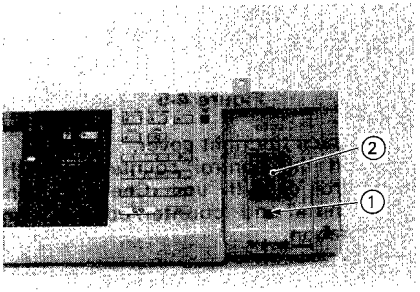
V. ATTACHING CONTROL CARD V

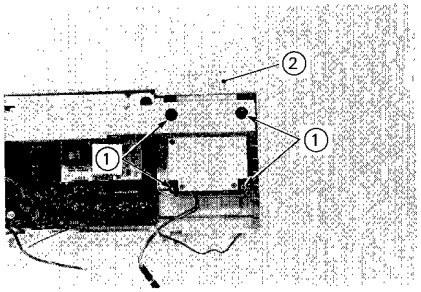
1) Remove the upper right cover.
2) Remove the upper left cover.
3) Remove the control panel.
4) Open the rubber cover, and remove the mounting screw from the face plate; thereafter, remove the face plate covering the card inlet.



① Mounting screw ② Rubber cover

Figure 4-6

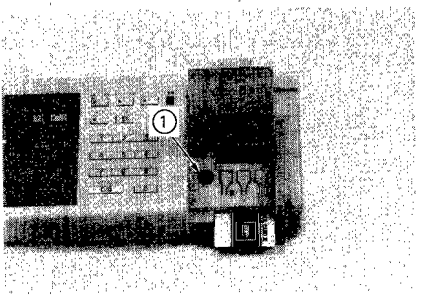
5) Turn the control panel over.
6) Attach the mylar sheet over the hole in the control panel for the control card V display.
7) Peel the protection sheet covering the control card V display.
8) Fix control card V on the control panel using four mounting screws. (Insert a card into control card V; fix control card V where the card can be inserted and removed without difficulty.)



① Mounting screws ② Card

Figure 4-7

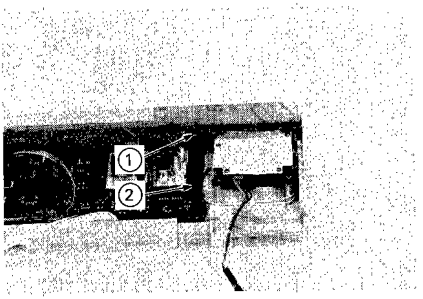
Check that the connector for the printer is centered over the hole.



① Connector

Figure 4-8

9) Fix the grounding cable of control card V with the screw shown in Figure 4-9.



① Mounting screw ② Grounding cable

Figure 4-9

10) Disconnect the shorting connector for JB shown in Figure 4-10.

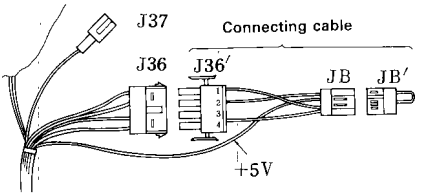


Figure 4-10

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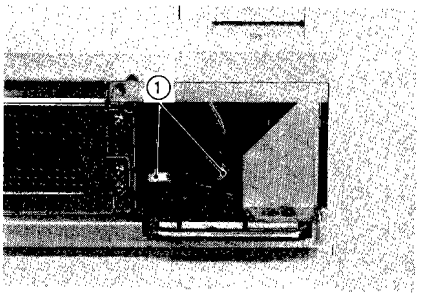
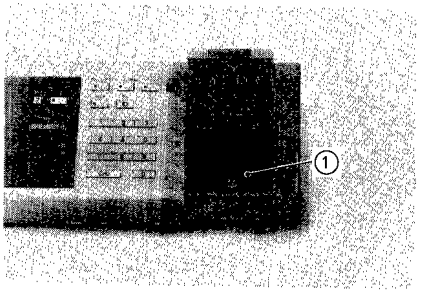
11) Connect the 4P connector of control card V and 4P connector of the copying machine.



① 4P connectors

Figure 4-11

12) Peel the protection sheet from the control panel of control card V.
13) Attach the control panel of control card V on the control panel of the copying machine.



① Control panel

Figure 4-12

14) Attach the control panel on the copying machine.
15) Turn the power of the copying machine ON, and check the operation of control card V.
16) Attach the upper front cover, upper right cover, and upper left cover.

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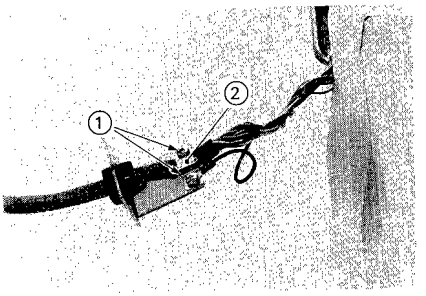
VI. CONNECTING THE CABLE OF THE NP EDITOR

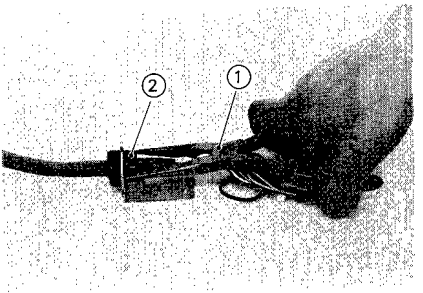
1) Detach the editor from the copying machine.
2) Remove the two screws, and remove the cable clamp.



① Screws ② Cable clamp

Figure 4-13

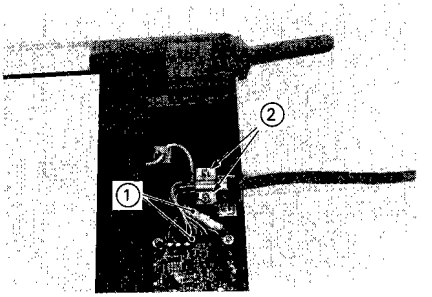
3) Push the bush using a wrench, and free the bush from the cable clamp.



① Wrench ② Bush

Figure 4-14

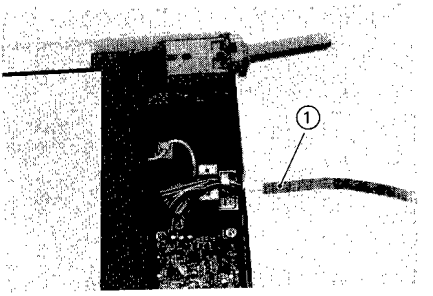
4) Detach the NP editor from the image scanner unit, and turn it over.
5) Remove the four screws, and remove the cover of the editor control PCB.
6) Remove the two connectors and two screws, and remove the cable clamp.



① Connectors ② Screws

Figure 4-15

7) Detach the cable.



① Cable

Figure 4-16

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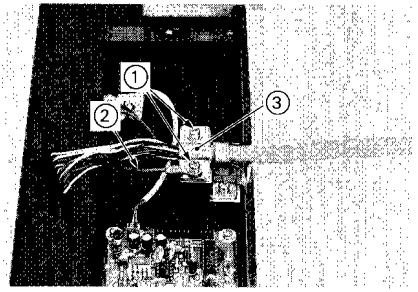
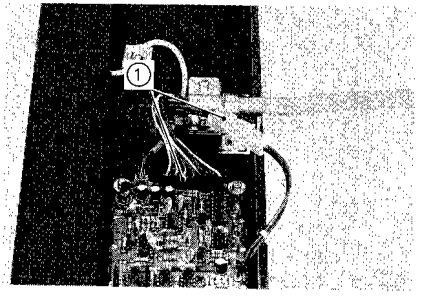
8) Lead the extension cable through the hole in the fitting, and hold its metal tape section in place by the cable clamp.
9) Fix the cable clamp together with the grounding cable using two screws.



① Screws ③ Cable clamp
② Grounding cable

Figure 4-17

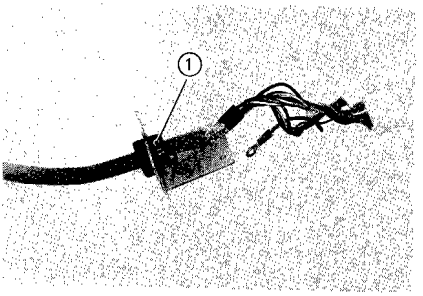
10) Connect the two connectors.



① Connectors

Figure 4-18

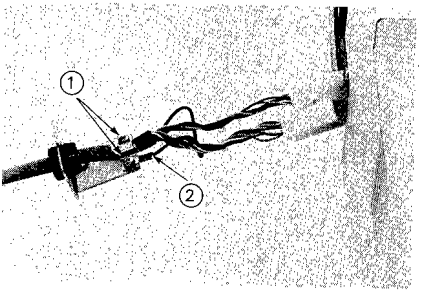
11) Install the cover of the editor control PCB.
12) Install the bush at the left end of the cable, and push it into the cable mount.



① Bush

Figure 4-19

13) Fix the cable clamp together with the grounding cable using two screws. (Hold the shield cable section.)
14) Connect the two connectors of the extension cable to the connectors of the image scanner unit.



① Screws ② Grounding cable

Figure 4-20

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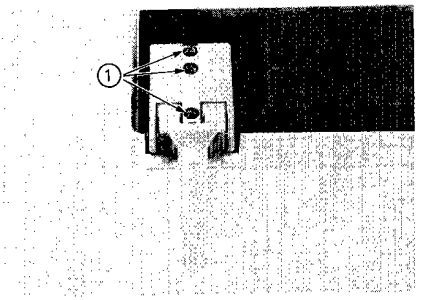
15) Install the cable mount on the image scanner unit using two screws.
16) Remove the three screws and support unit if the editor is to be used as a fixed type.



① Screws

Figure 4-21

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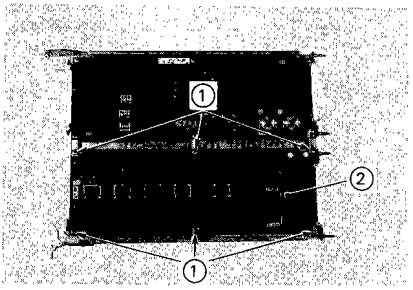
VII. ATTACHING BIT MAP MEMORY PCB

1) Remove the front cover.
2) Detach the CPU PCB.
3) Attach the bit map memory PCB using six screws.



① Screws ② Bit map memory PCB

Figure 4-22

4) Enter the service mode of the scanner unit, and select "USER OPTIONS"; change BIT MAP so that it is '1' instead of '0'.

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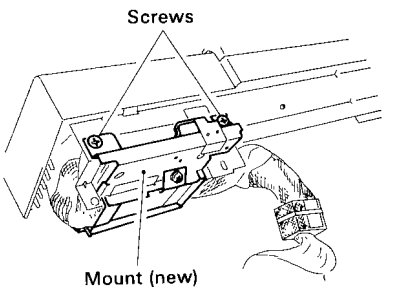
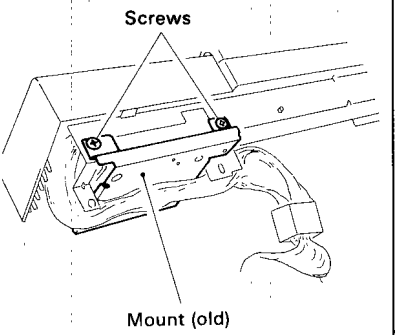
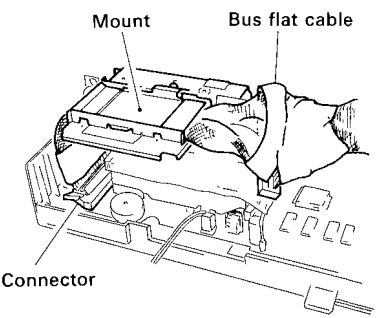
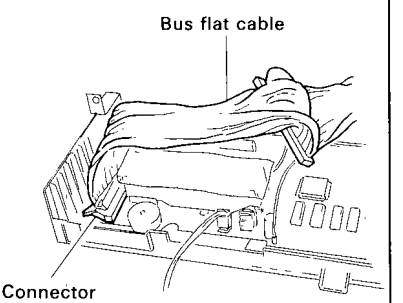
VIII. ATTACHING THE IC CARD UNIT II

Step	Machine Accommodating IC Card	Machine Not Accommodating IC Card
1		Check that the CPU PCB in the scanner unit is of rev. 030 or later.
2		Check that the ROMs (Q530, Q537, Q544) on the CPU PCB in the scanner unit are of ver. 13 or later.
3	Detach the control panel from the copier.	
4	Remove the two screws from the IC card unit mount. 	Remove the two screws, and detach the IC card mount; the mount may be put away. 
5	Disconnect the connector from the control PCB of the control panel, and detach the bus flat cable together with the mount; do not detach the cable from the mount. 	Disconnect the connector from the control PCB of the control panel, and detach the bus flat cable; the cable may be put away. 

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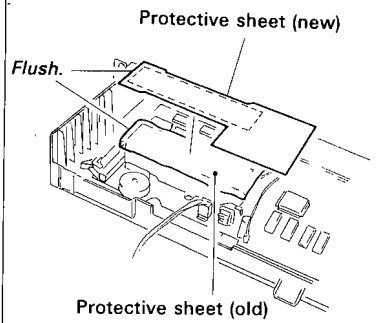
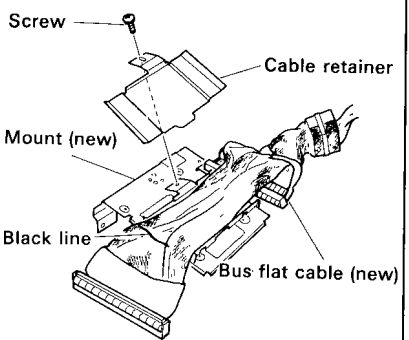
Step	Machine Accommodating IC Card	Machine Not Accommodating IC Card
6		Attach the protective sheet (new) over the protective sheet of the cable guide on the control PCB of the control unit; make sure that the left edges of the sheets are flush. 
7		Place the flat cable keeping its black line flush with the left edge, and attach the cable retainer over the cable. *Note:* *Make sure that the cable is not trapped.* 

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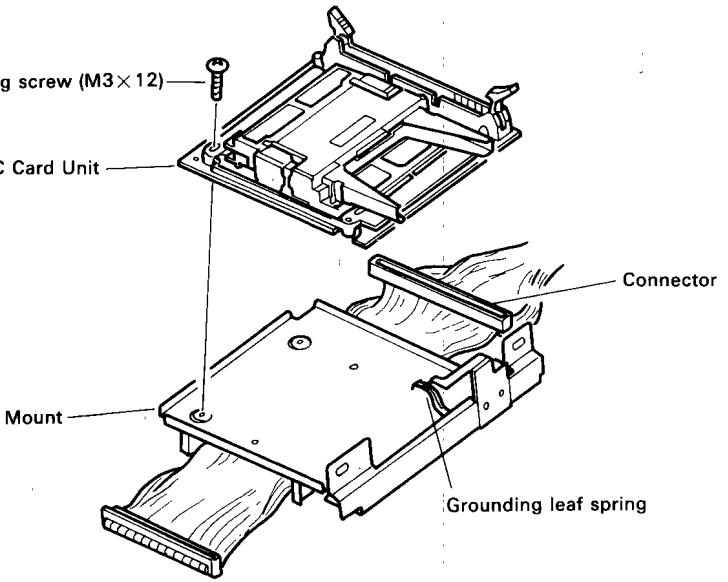
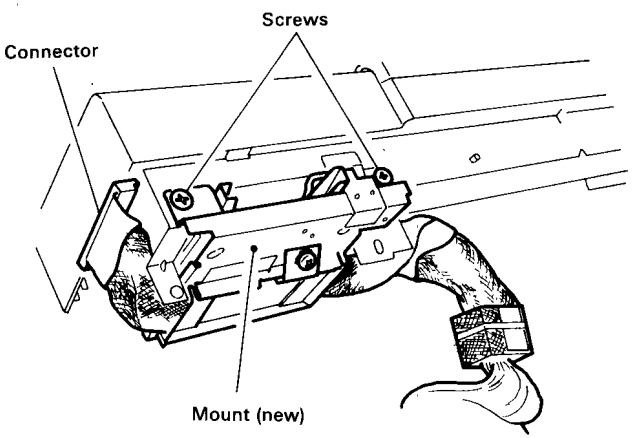
Step	Machine Accommodating IC Card	Machine Not Accommodating IC Card
8	Attach the IC Card Unit using two binding screws (M3×12), and connect the connector. *Note:* *Take care not to deform the grounding leaf spring.*	
9	Attach the IC Card Unit using two screws, and connect the connector to the control PCB of the control panel. *Note:* *Make sure that the cable is not trapped.*	





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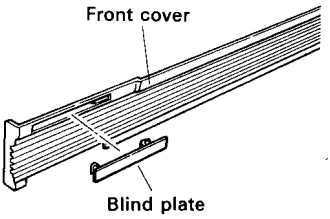
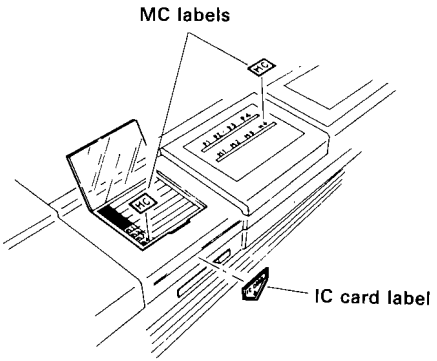
Step	Machine Accommodating IC Card	Machine Not Accommodating IC Card
10	Attach the control panel to the copier.	
11	Detach the blind plate for the IC card from the front cover.  	
12	Attach the fron cover to the copier.	
13	Attach the IC card label above the IC card slot. *Note:* *Make sure that the label is above the front cover yet will not be put out of view when the mode memory key is slid.*  	
14	Attach the MC labels over M4 of the Copy Mode key and the Copy Mode Memo label; see the figure for step 13.	
15	Attach the 'Innovatron license' seal below the ratings plate on the rear cover of the copying machine; this step is applicable if the seal is found together with the Innovatron license seal.	

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I. PARTS TO BE REPLACED PERIODICALLY

There are no components in the image scanner unit which need to be replaced periodically.

II. EXPECTED SERVICE LIVES OF CONSUMABLES

The parts listed below may require replacement during the warranty period, but are to be replaced only if they are faulty or worn. The expected service lives of these parts are as follows.

JAN. 1993

No.	Part name	Part No.	Quantity	Service life (No. of sheets)	Remarks
1.	Scanning lamp	FH7-3090-020	1	20,000	
2.	Illumination lamp	FH7-3092-000	1	1 year	3000 hours

Note:
The data given above is an estimate only and is subject to change based on future data.

III. PREVENTIVE MAINTENANCE SERVICE SCHEDULE

Note:
Use only the specified solvents and lubricants.

△: Clean ●: Replace ×: Lubricate □: Adjust ◎: Inspect

Unit name	Location	Maintenance Interval					Remarks
		10,000 sheets	20,000 sheets	50,000 sheets	100,000 sheets	300,000 sheets	
Exterior	Copyboard glass	△					Alcohol
	Pressure sheet	△					
Optical path	Fiber optic lens array	△					Lint-free paper
	Reflectors of DS unit	△					Blower brush

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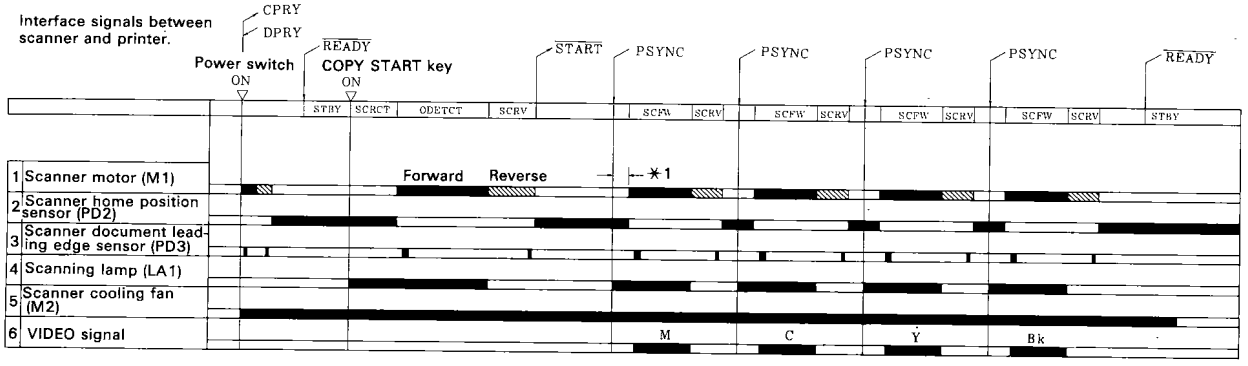
A. SCANNER GENERAL TIMING CHART



*1: This time can be changed by the reproduction ratio and the quantity or image shift.

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B. LIST OF SIGNALS/COMMANDS IN SCANNER

SIGNALS AND COMMANDS

BD	BEAM DETECT signal
CCNTD	CONTROL COUNTER DRIVE command
CCNTDT	CONTROL COUNTER DETECT signal
CONNECT	CONNECT signal
CMD	COMMAND signal
CPRY	SCANNER POWER READY signal
CRR	COMMAND RECEIVE READY signal
DLEG	DOCUMENT LEADING EDGE signal
DRRY	PRINTER POWER READY signal
LE	LINE ENABLE signal
[LINT]	LIGHT INTENSITY signal
LLIMIT	SCANNER LEFT LIMIT signal
LRD	LAMP REGULATOR DRIVE command
LSYNC	LINE SYNCHRONOUS signal
PCNCT	PROJECTOR CONNECT signal
POWON	PROJECTOR POWER ON command
PSYINC	PAGE SYNCHRONOUS signal
READY	PRIVTER READY signal
REMOTE	PROJECTOR LAMP INTENSITY CONTROL command
RLIMIT	SCANNER RIGHT LIMIT signal
SCHP	SCANNER HOME POSITION sinal
SCREEN	SCREEN signal
SRR	STATUS RECEIVE READY signal
START	[PRINTER] START signal
STS	STATUS signal
VCLK	VODEO CLOCK PULSE signal
VDO 7 – 0	VIDEO signal

ABBREVIATION

ODETCT	ORIGINAL DETECT stage
SCFW	SCANNER FORWARD stage
SCRCT	SHADING CORPECTION stage
SCRV	SCANNER REVERSE stage
SREADY	SCANNER READY stage

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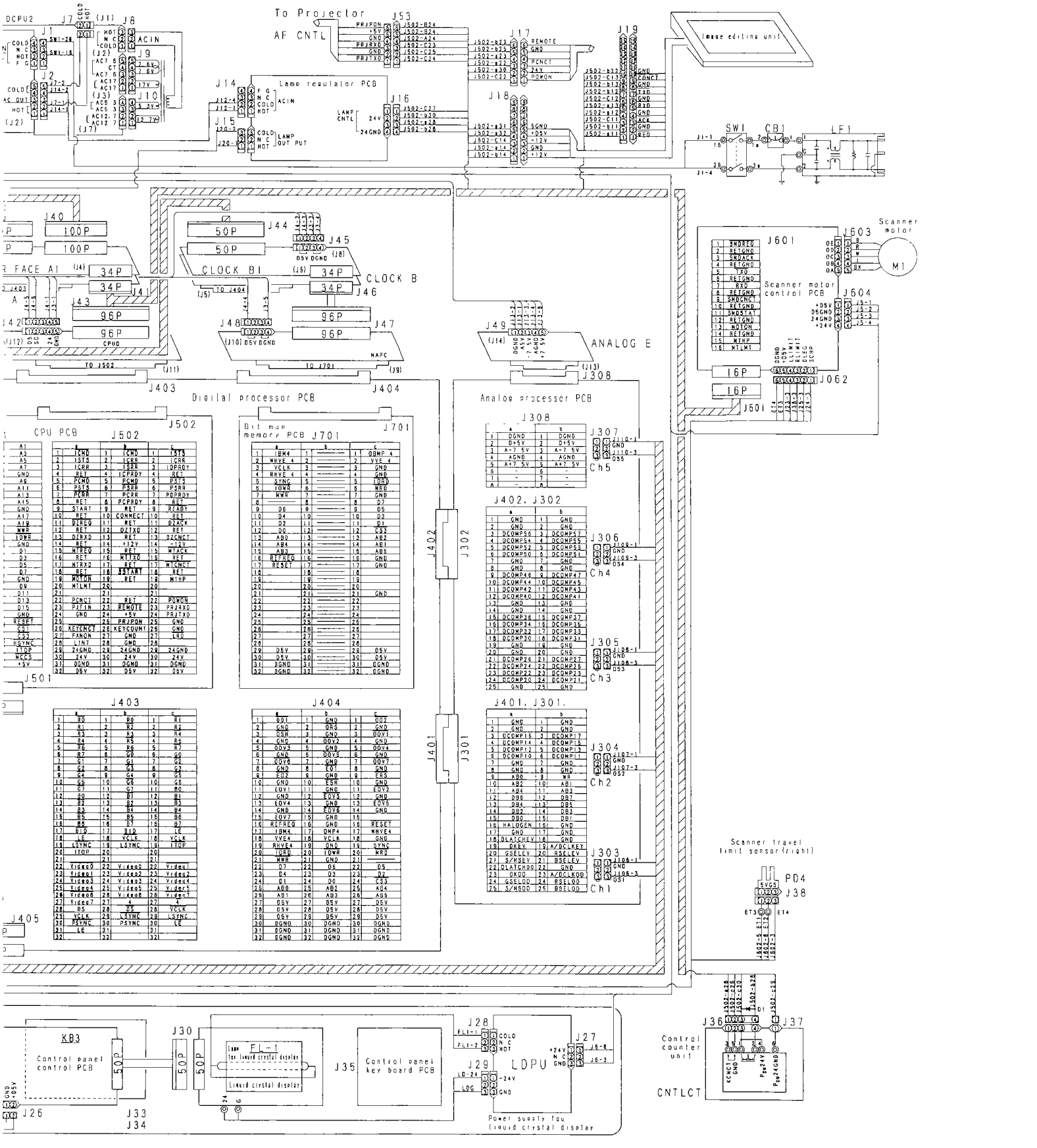
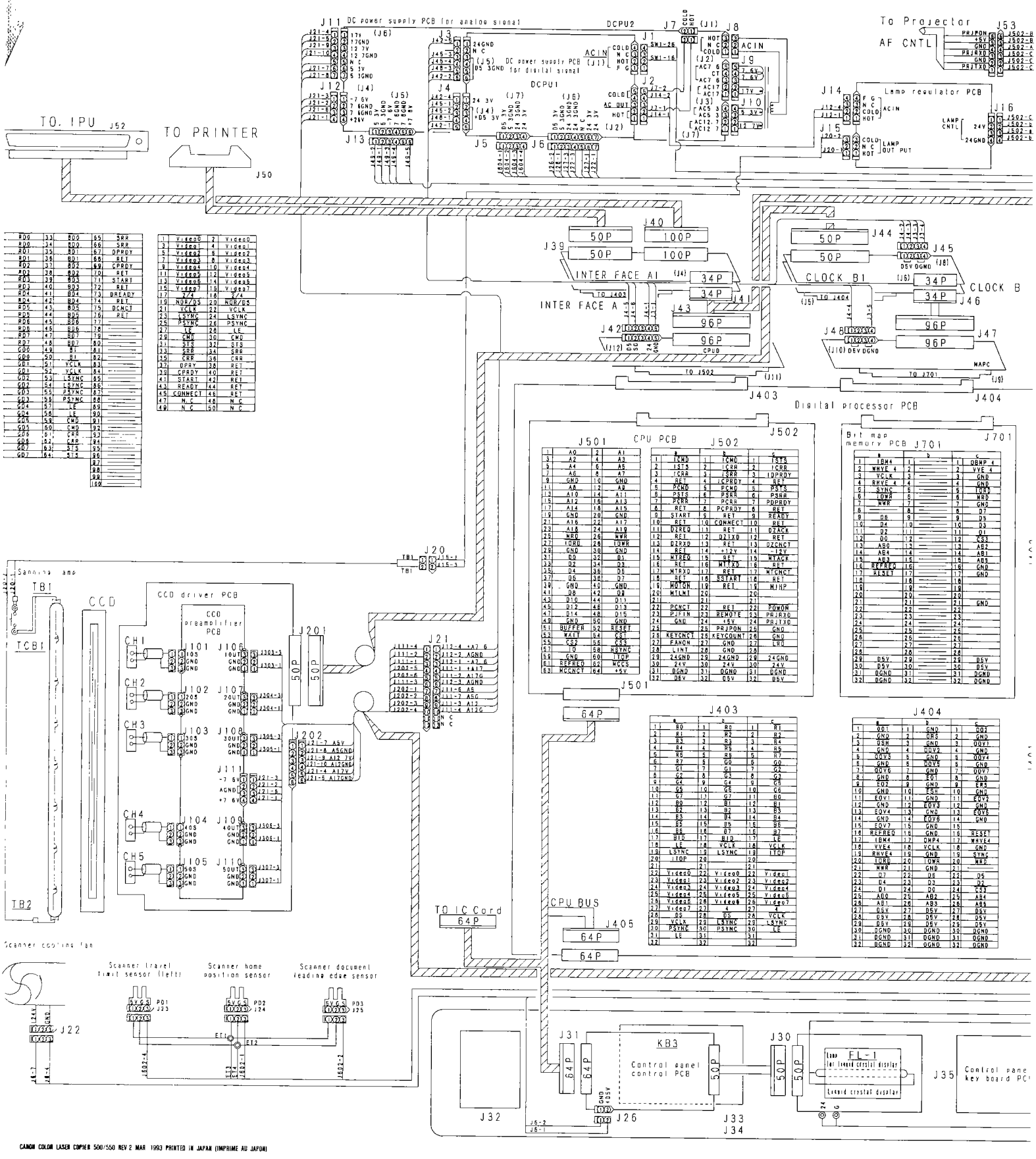
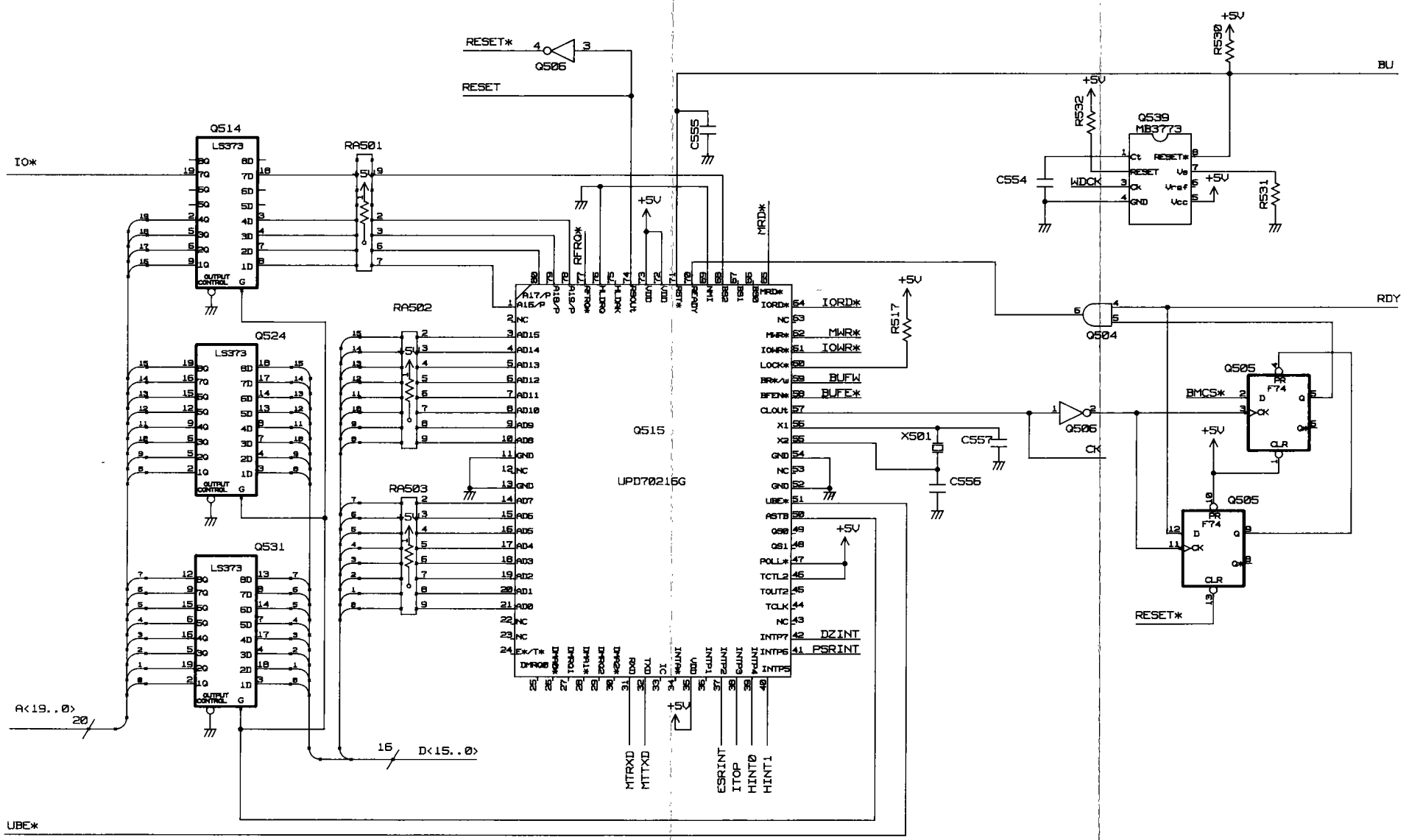
C. SCANNER GENERAL CIRCUIT DIAGRAM




TO. IPU J52
TO PRINTER
J50
J11 DC power supply PCB for analog signal
DCPU2
DCPU1
J12
J13
J3
J4
J5
J6
J7
J8
J9
J10
J1
J2
AC IN
To Projector
AF CNTL
J53
Lamp regulator PCB
J14
J15
J16
LAMP CNTL
24V
24GND
LAMP OUT PUT
J40
J39
50P
100P
INTER FACE AI
INTER FACE A
34P
J41
J42
96P
CPUD
J43
J44
J45
CLOCK BI
CLOCK B
J46
J48
J47
DEV DGND
MAPC
TO J502
TO J701
TO J403
TO J404
Digital processor PCB
J501
CPU PCB
J502
Bit map memory PCB J701
J20
TB1
TB2
Scanning lamp
CCD
TCB1
CCD driver PCB
CCD preamplifier PCB
CH1
CH2
CH3
CH4
CH5
J101
J102
J103
J104
J105
J106
J107
J108
J109
J110
J201
J202
J111
J21
64P
TO IC Cord
CPU BUS
J405
Scanner cooling fan
Scanner travel limit sensor (left)
Scanner home position sensor
Scanner document leading edge sensor
PD1
PD2
PD3
J22
J23
J24
J25
J31
J30
J32
J33
J34
J35
KB3
Control panel control PCB
FL-1
for 5-segment crystal display
5-segment crystal display
Control panel key board PCB
J26

COLOR LASER COPIER 500/550 SCANNER

SERVICE MANUAL



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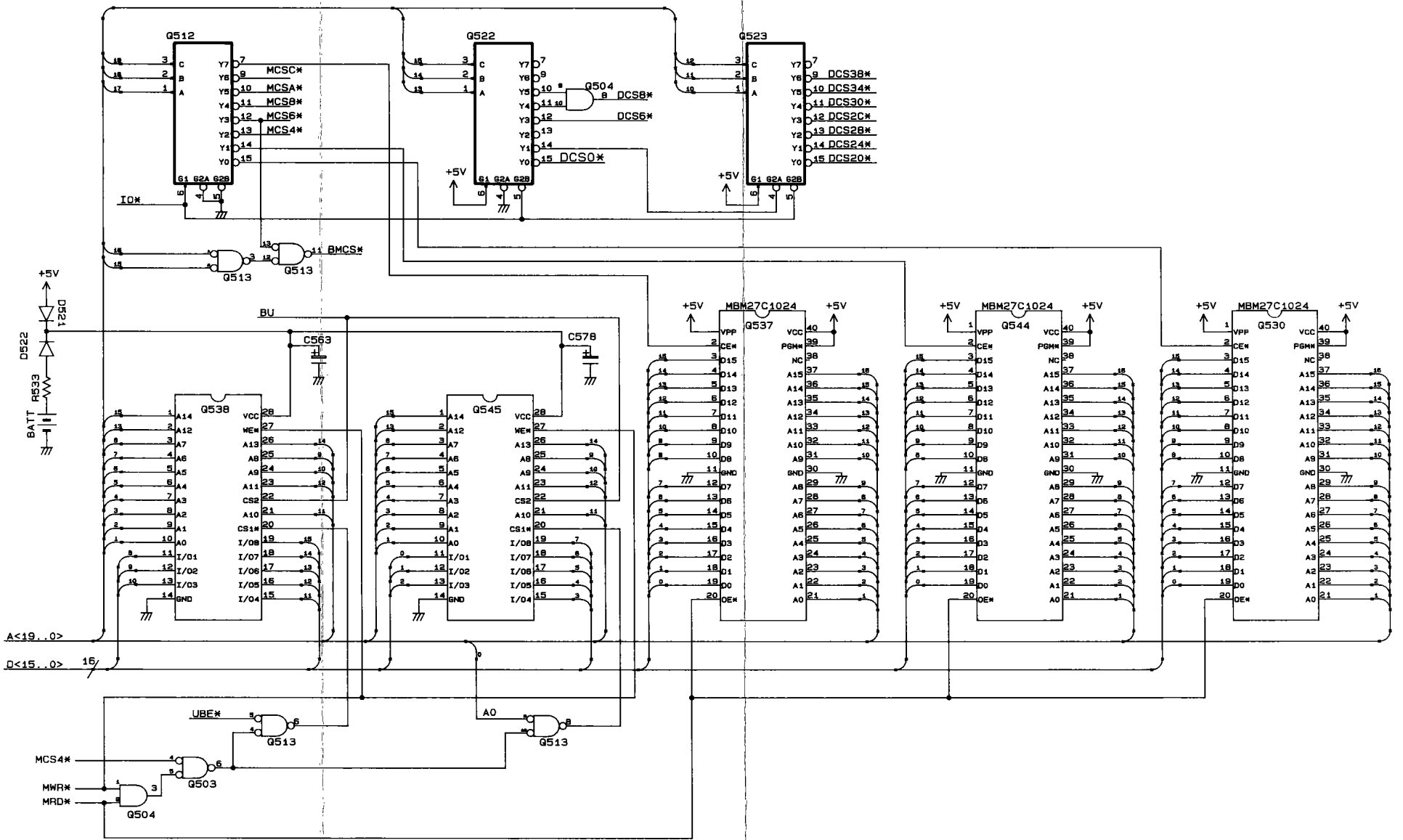

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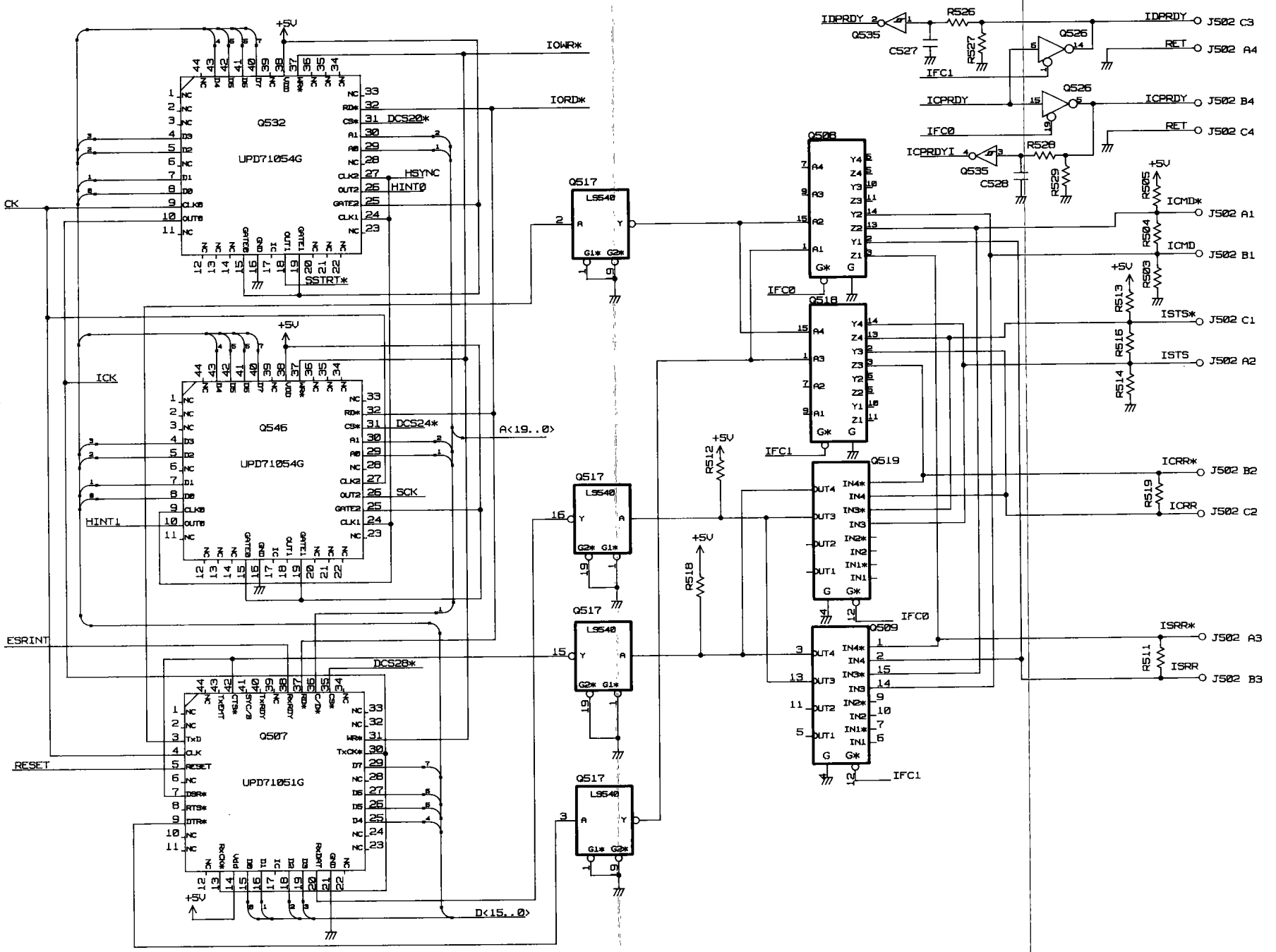

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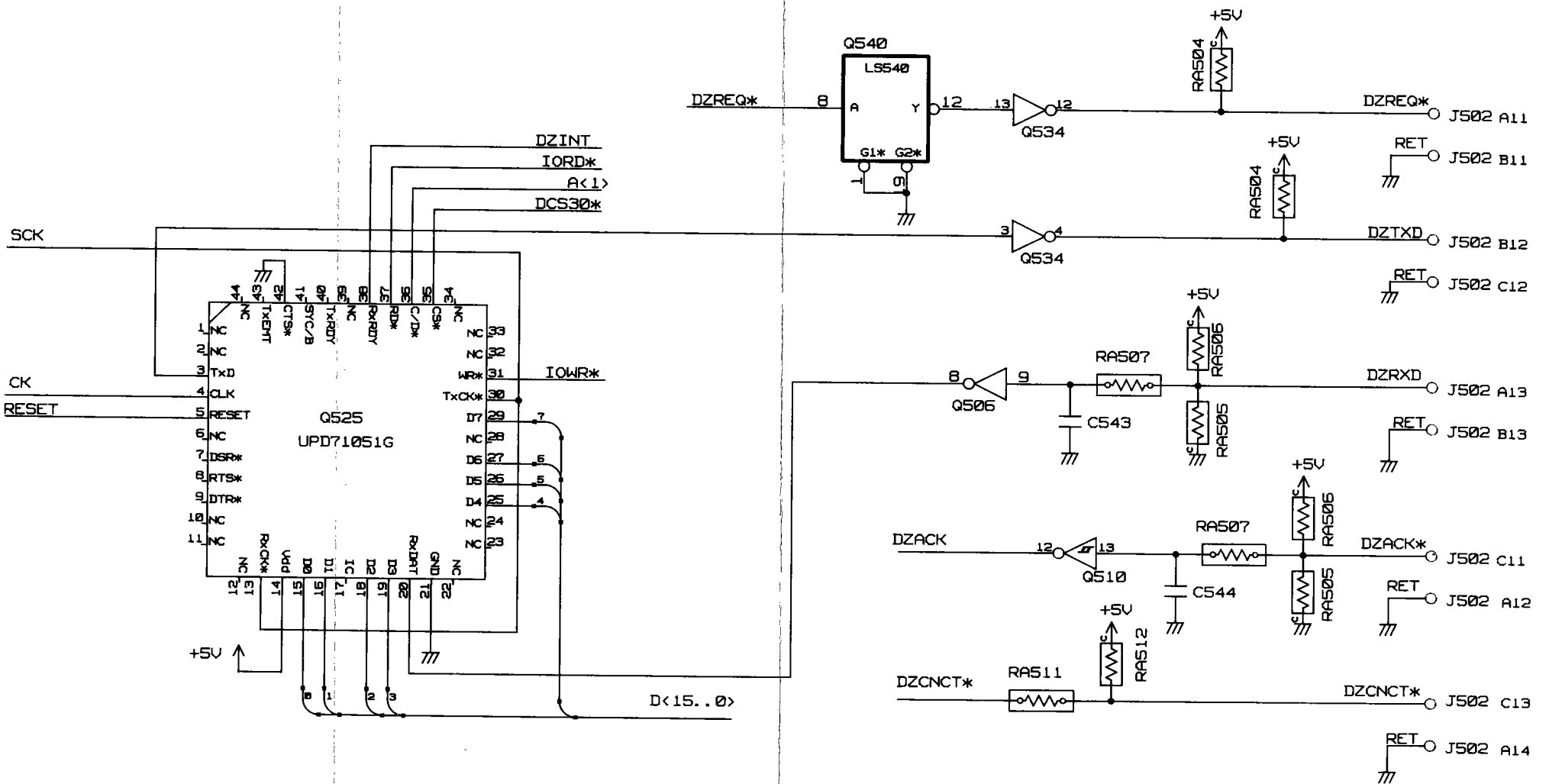

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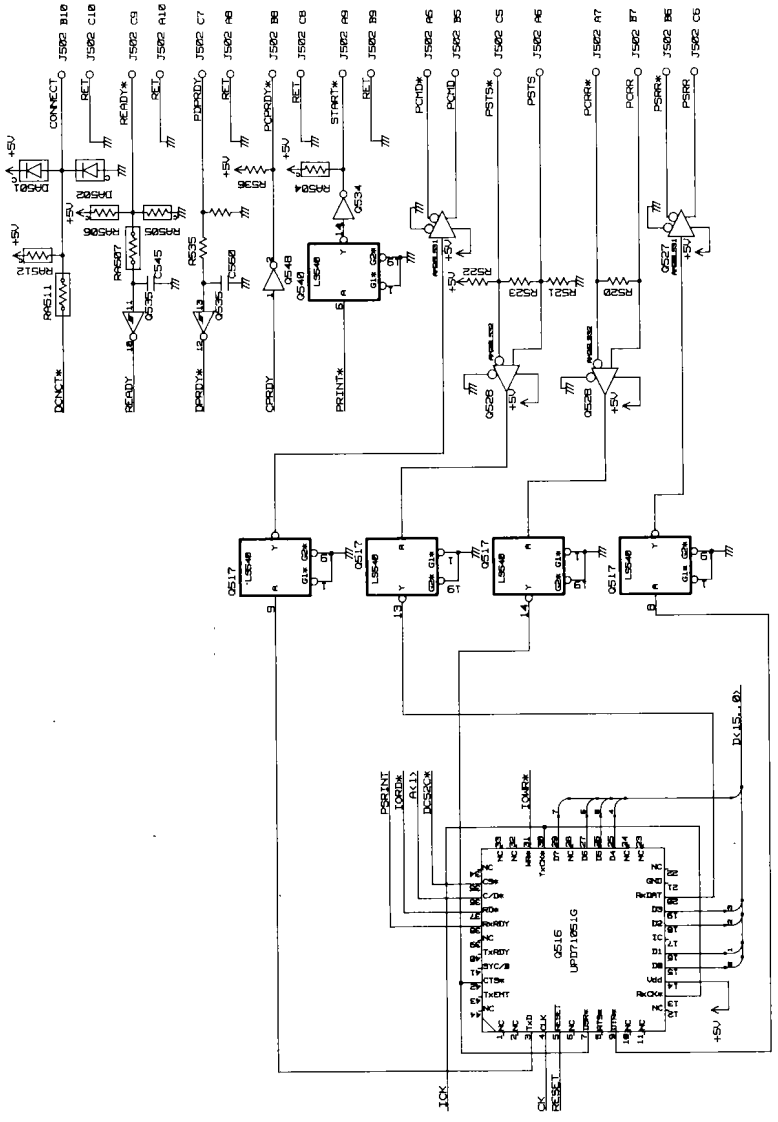

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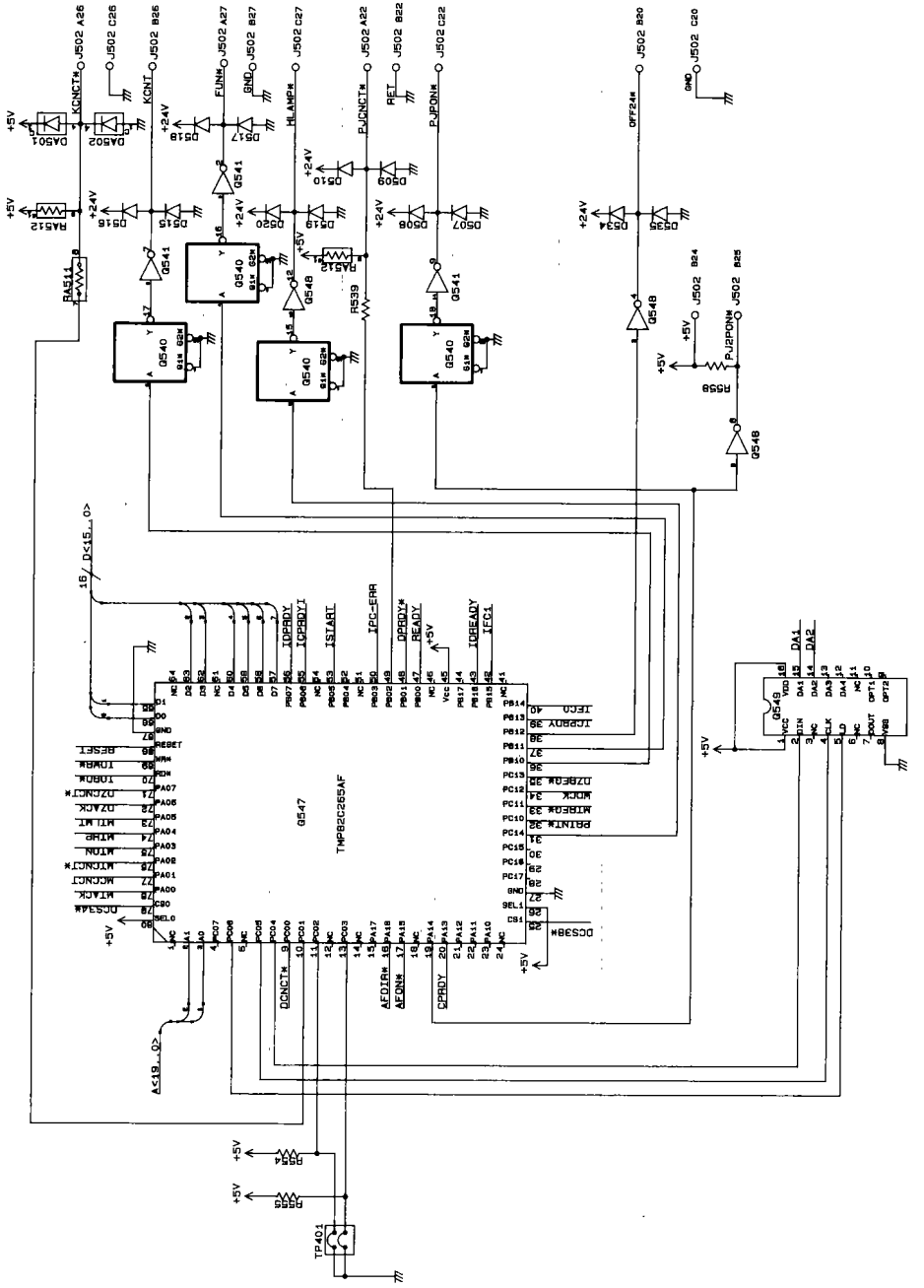
CPU PCB (6/12)



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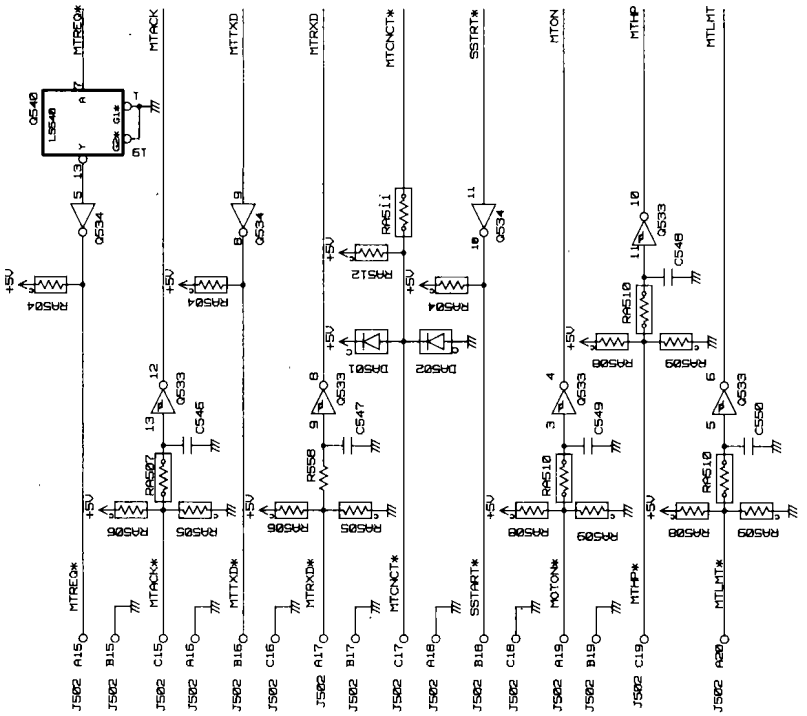

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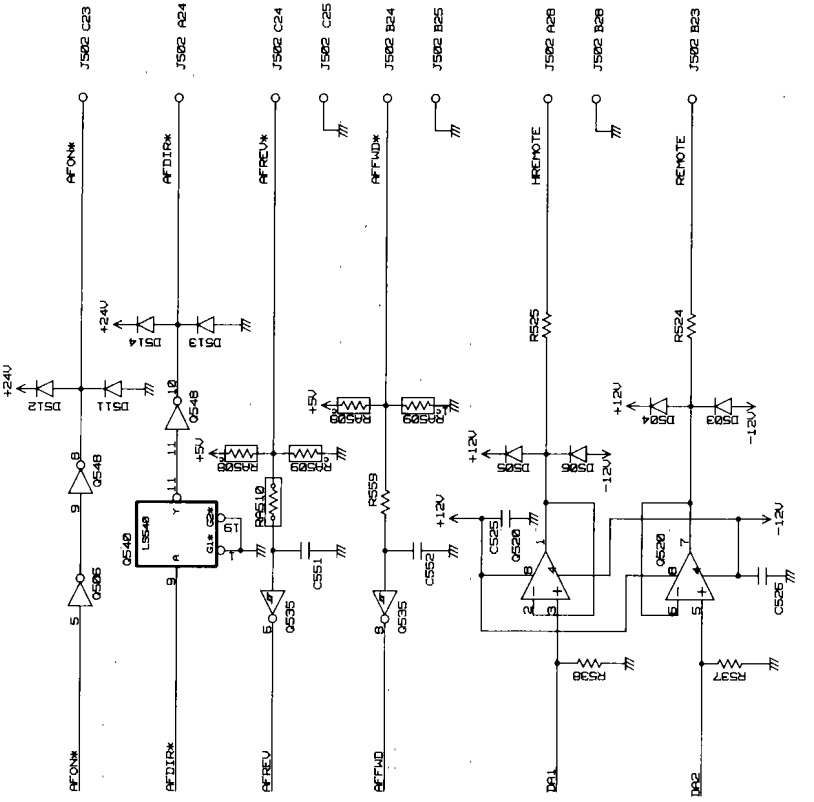
CPU PCB (8/12)



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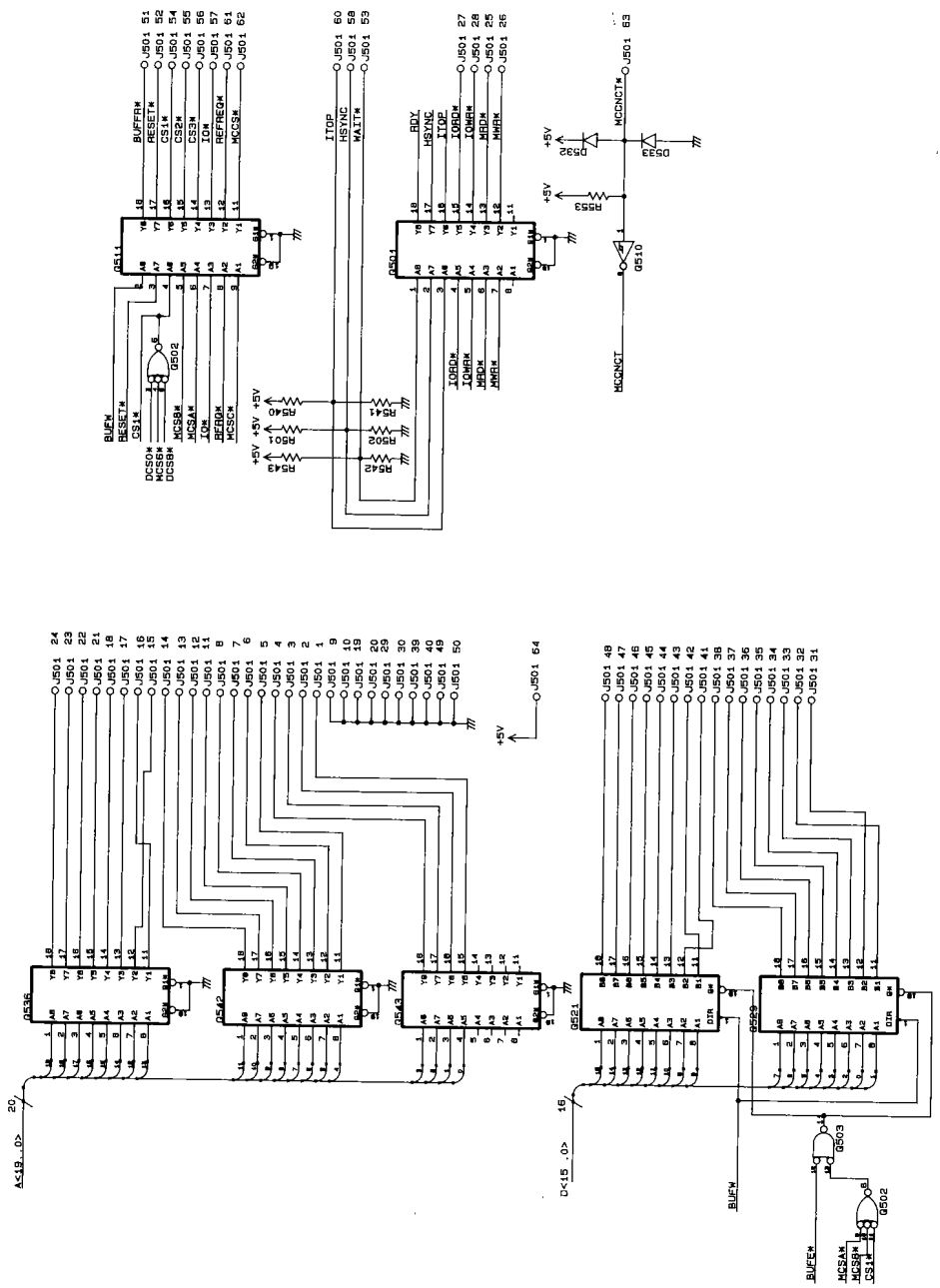

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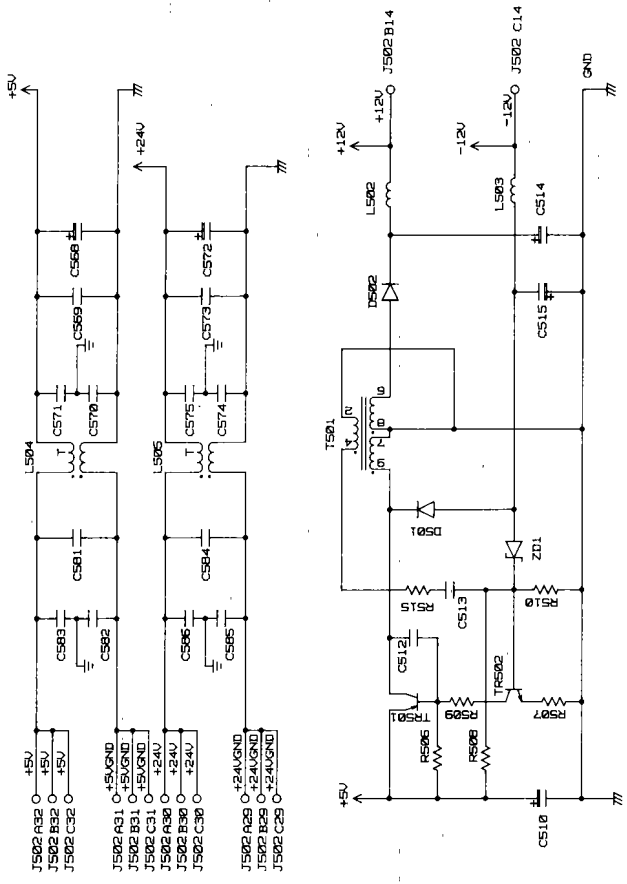

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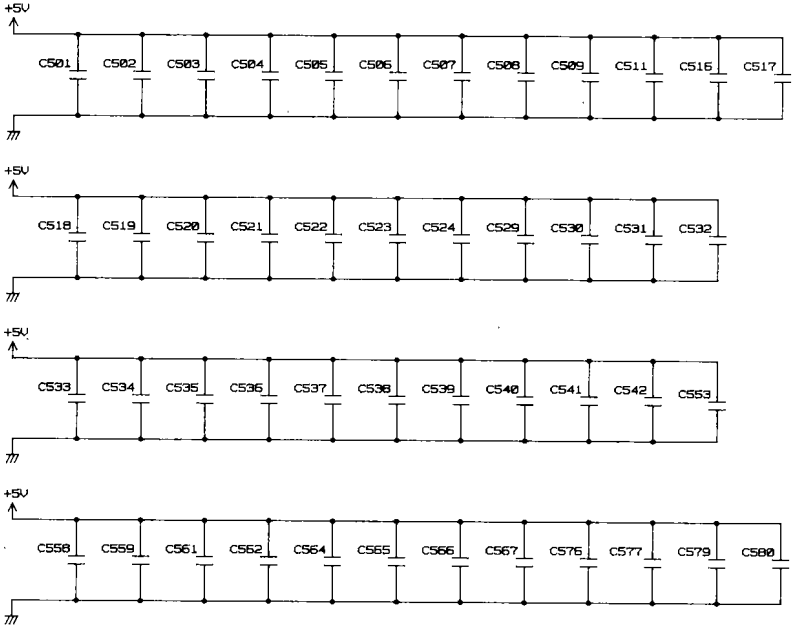
CPU PCB (11/12)



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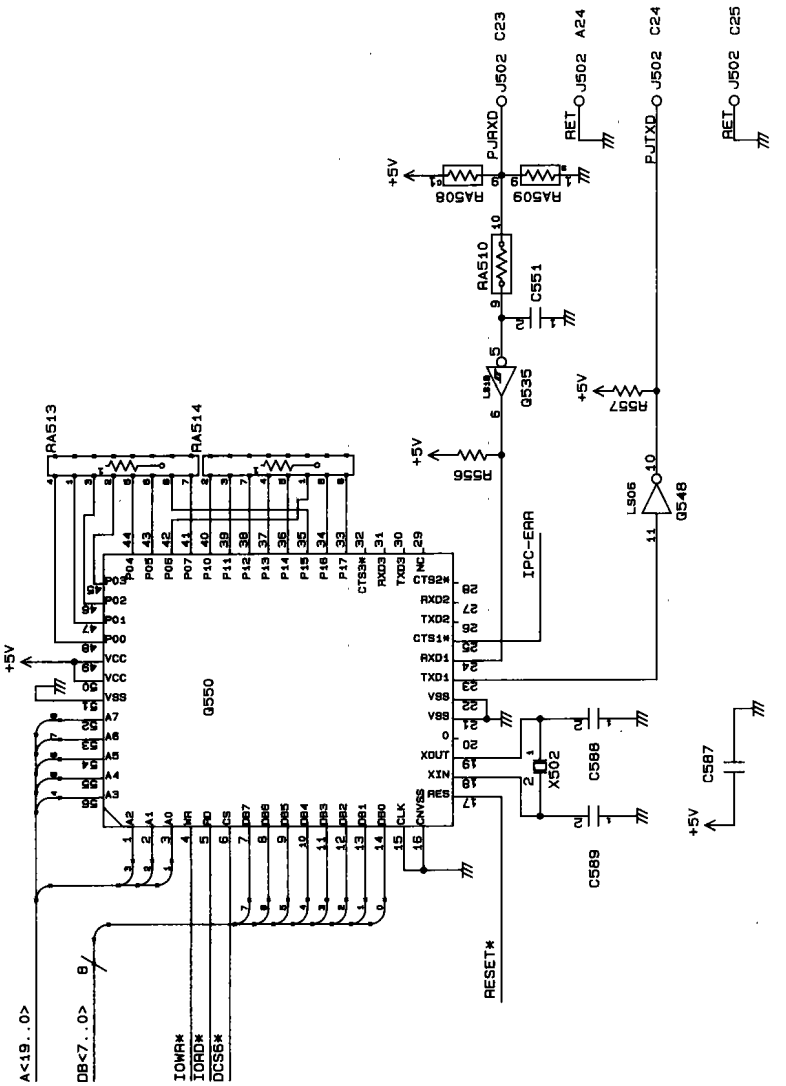
CPU PCB (12/12)



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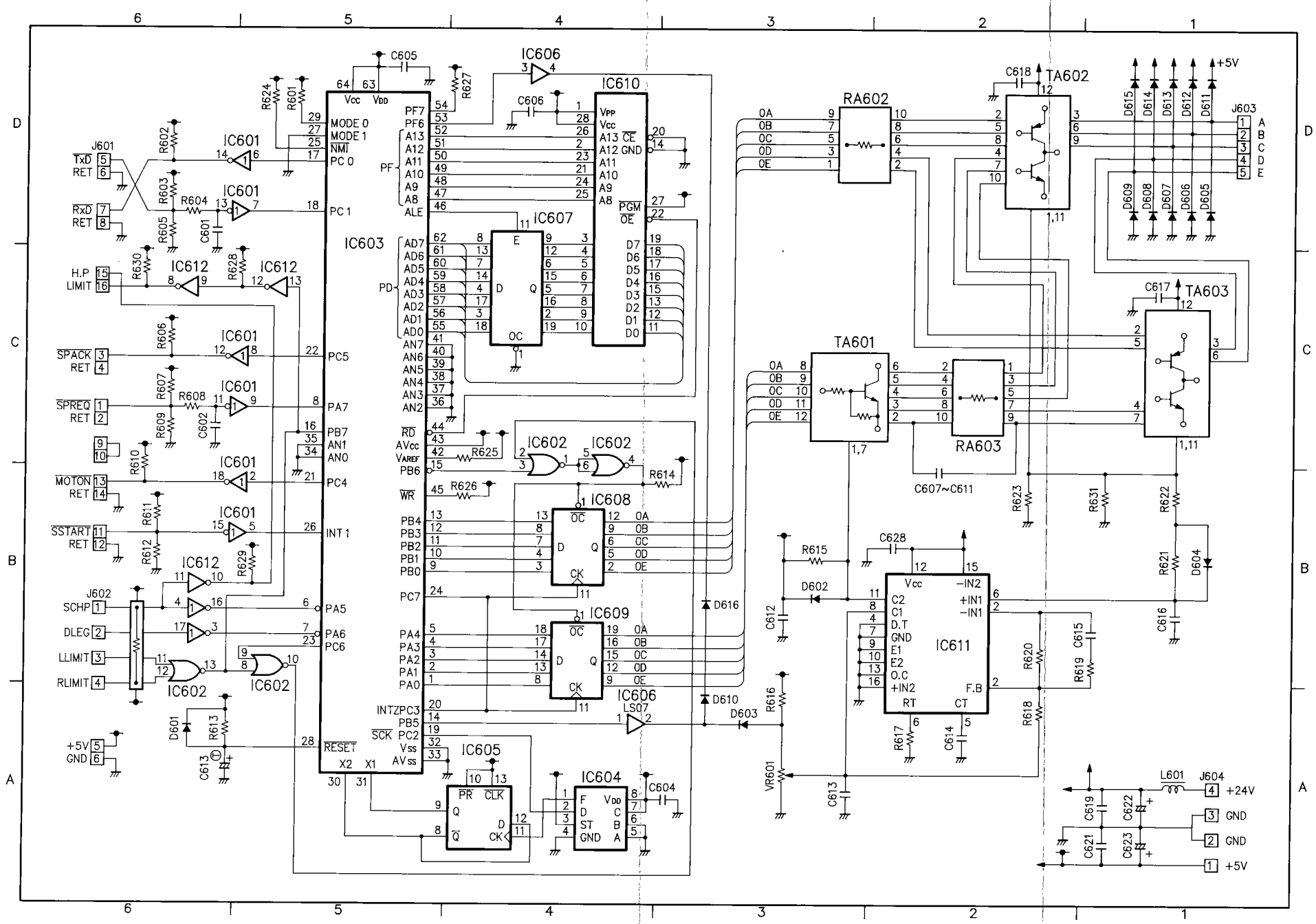

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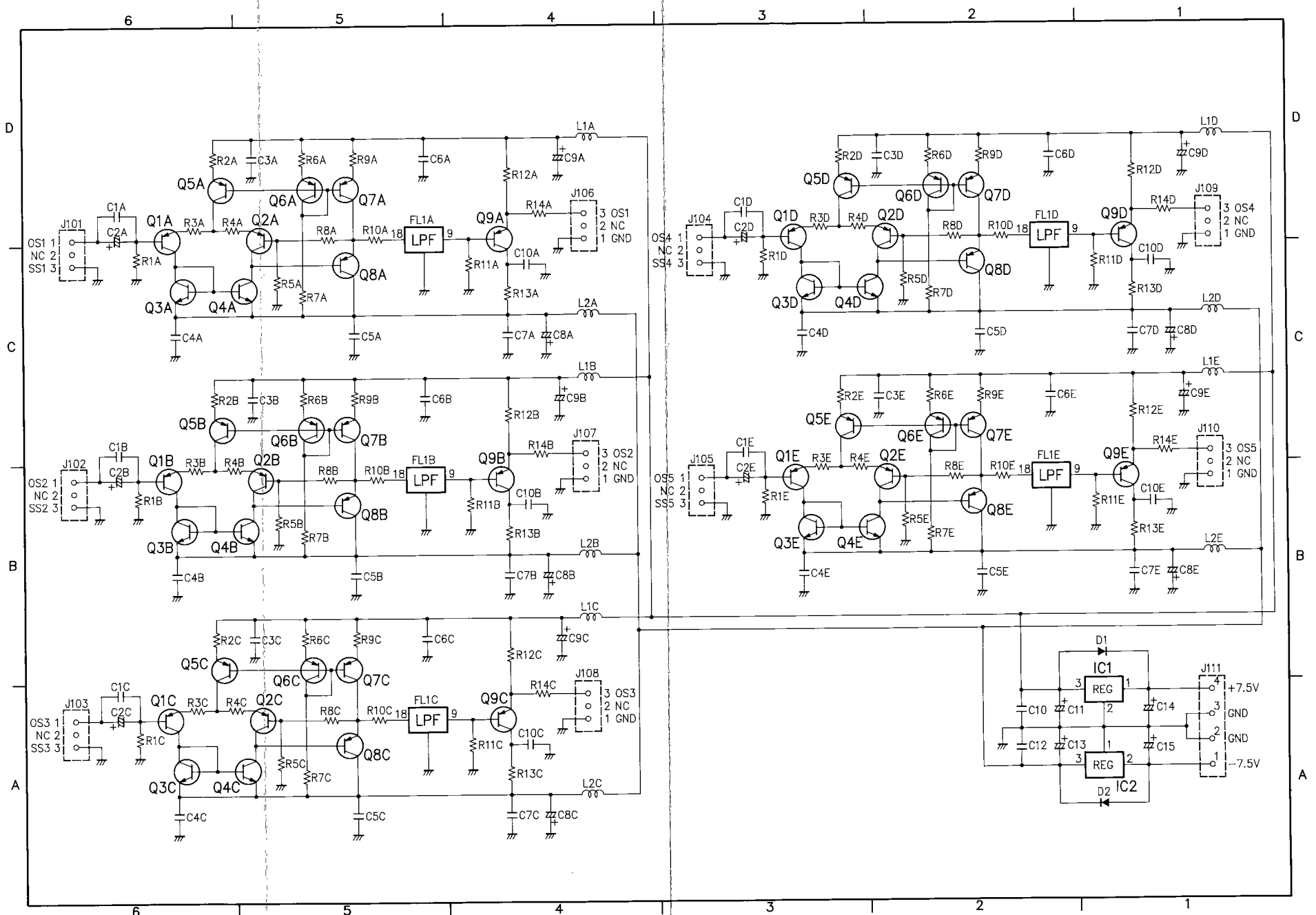
F. CCD PREAMPLIFIER PCB



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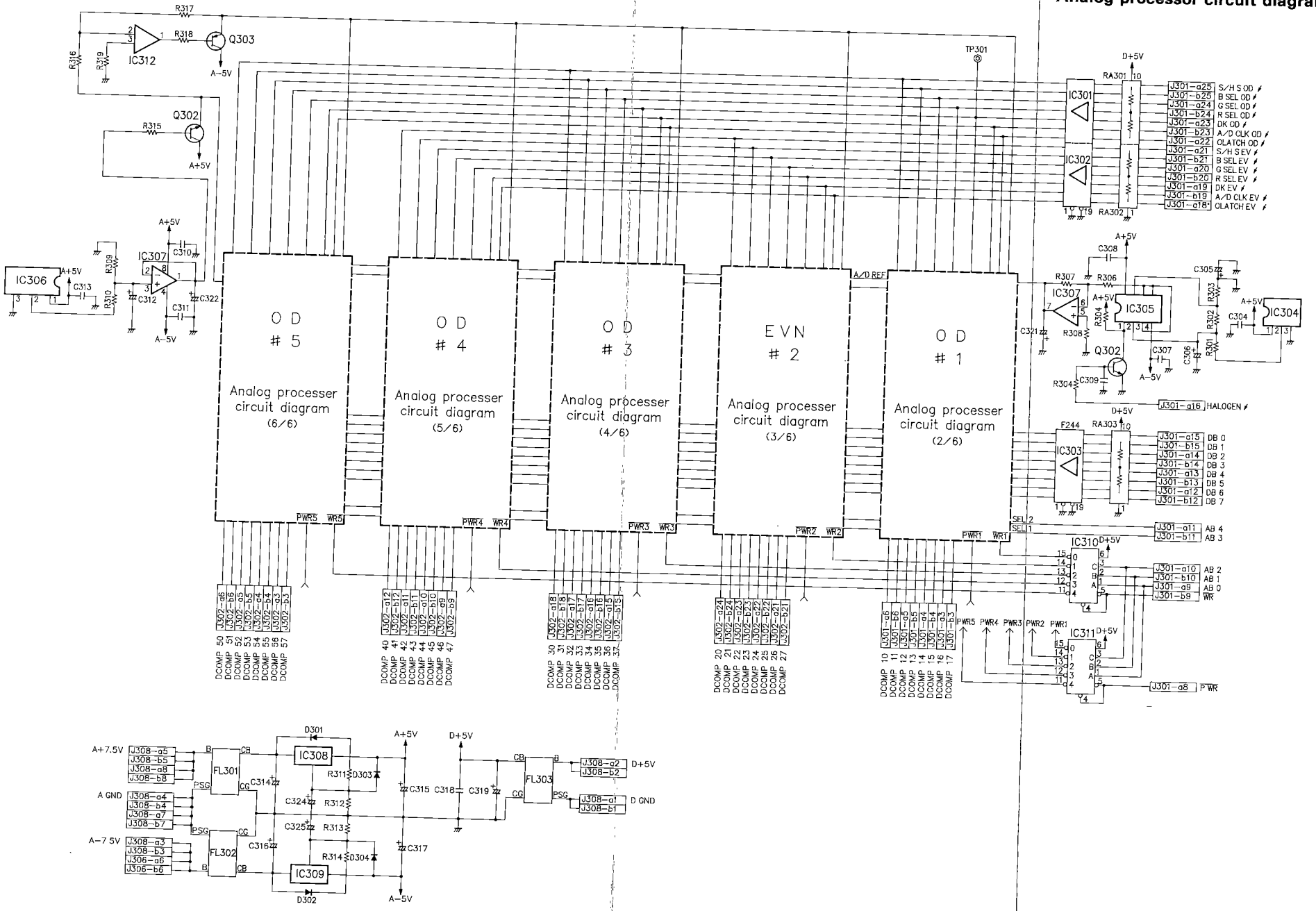
G. ANALOG PROCESSOR PCB

Analog processor circuit diagram (1/6)



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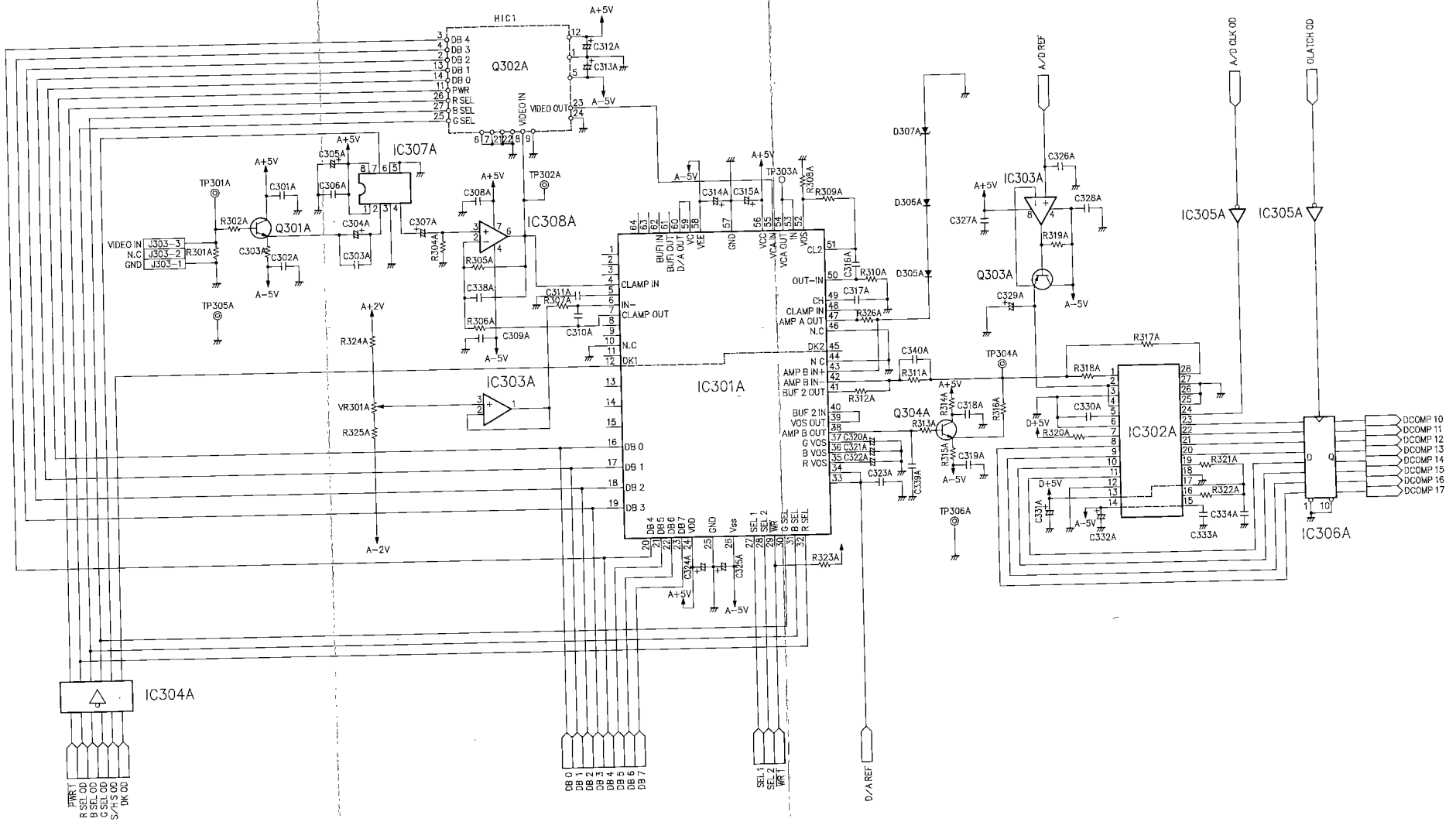
Analog processor circuit diagram (2/6)



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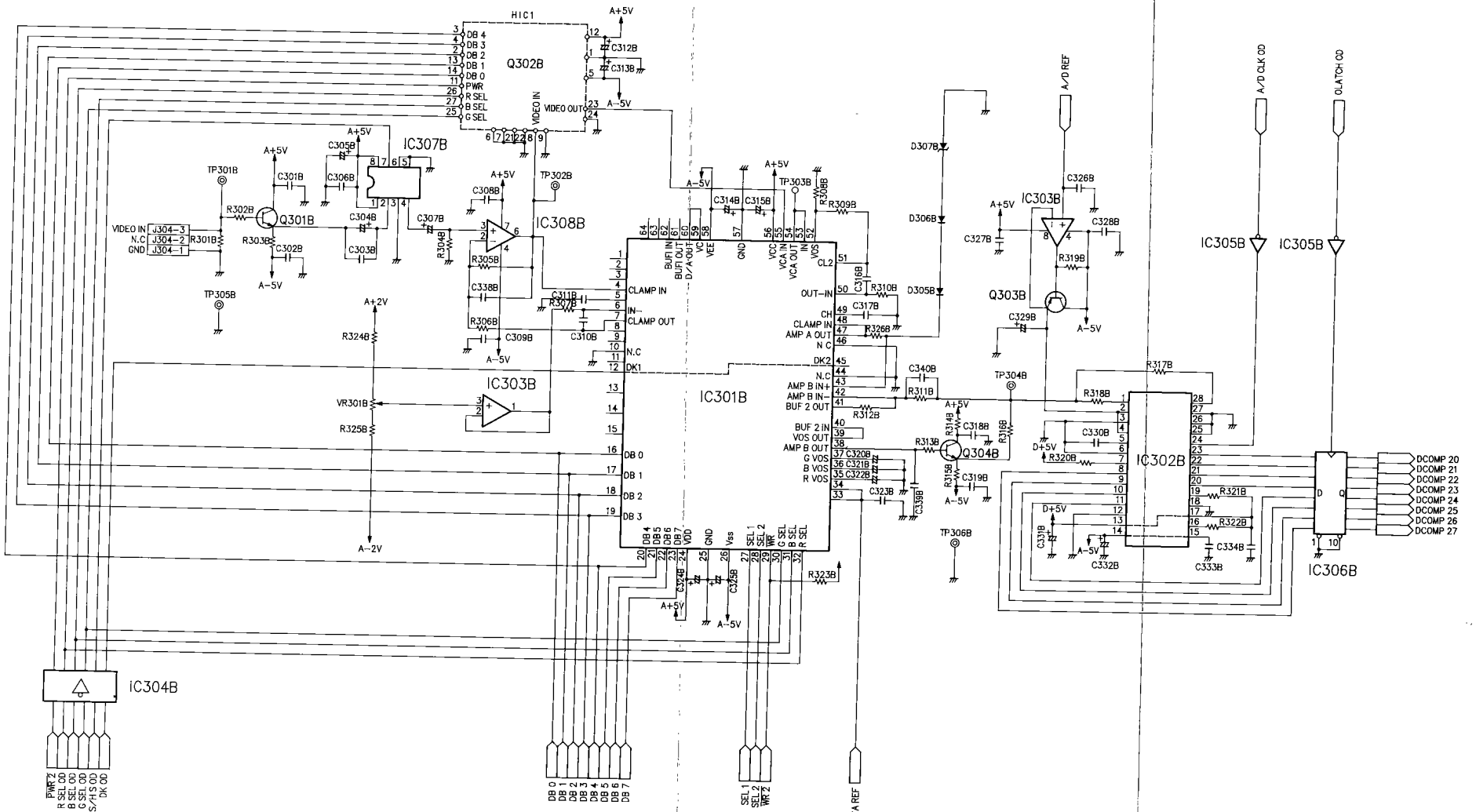
Analog processor circuit diagram (3/6)



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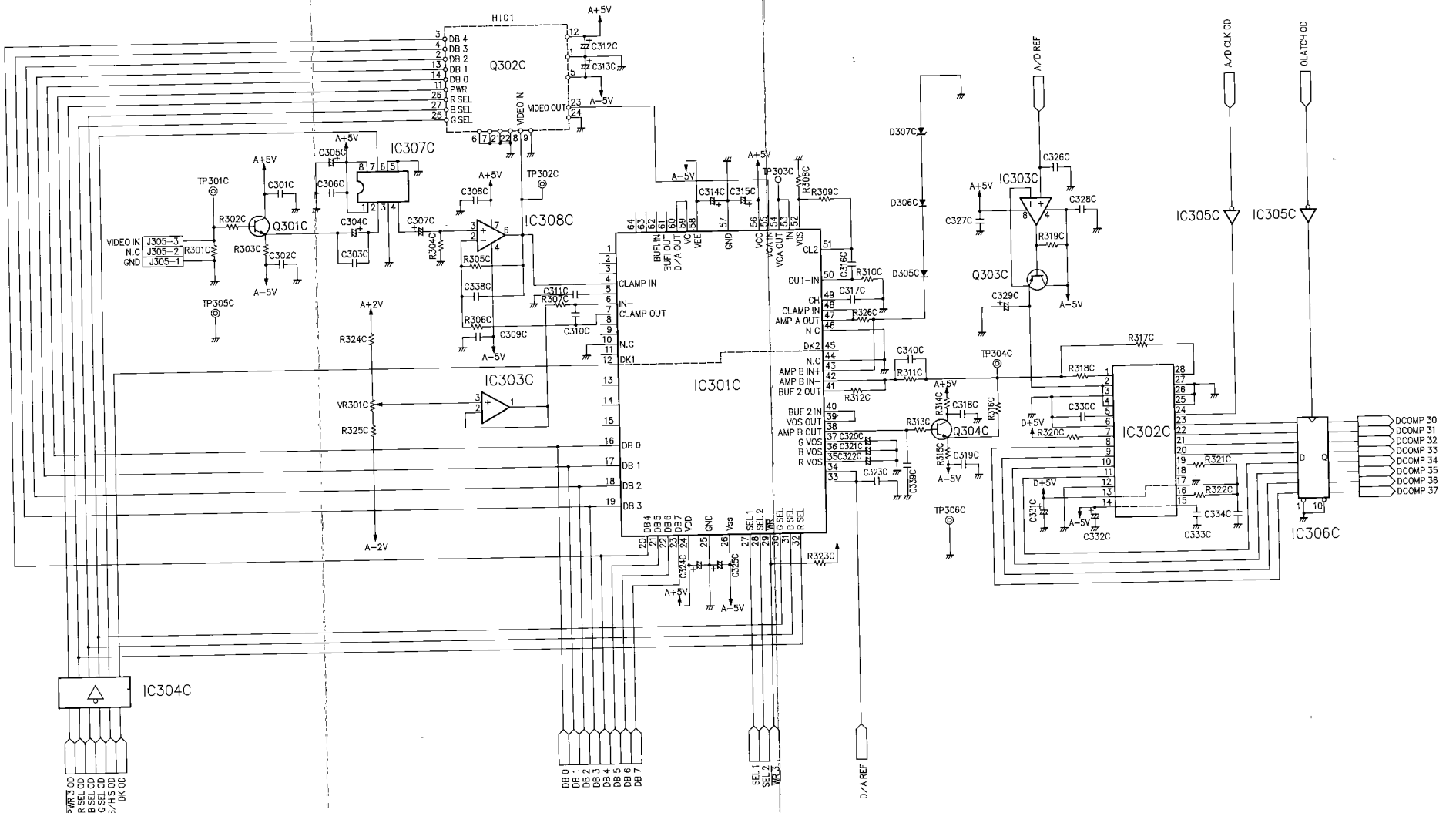
Analog processor circuit diagram (4/6)



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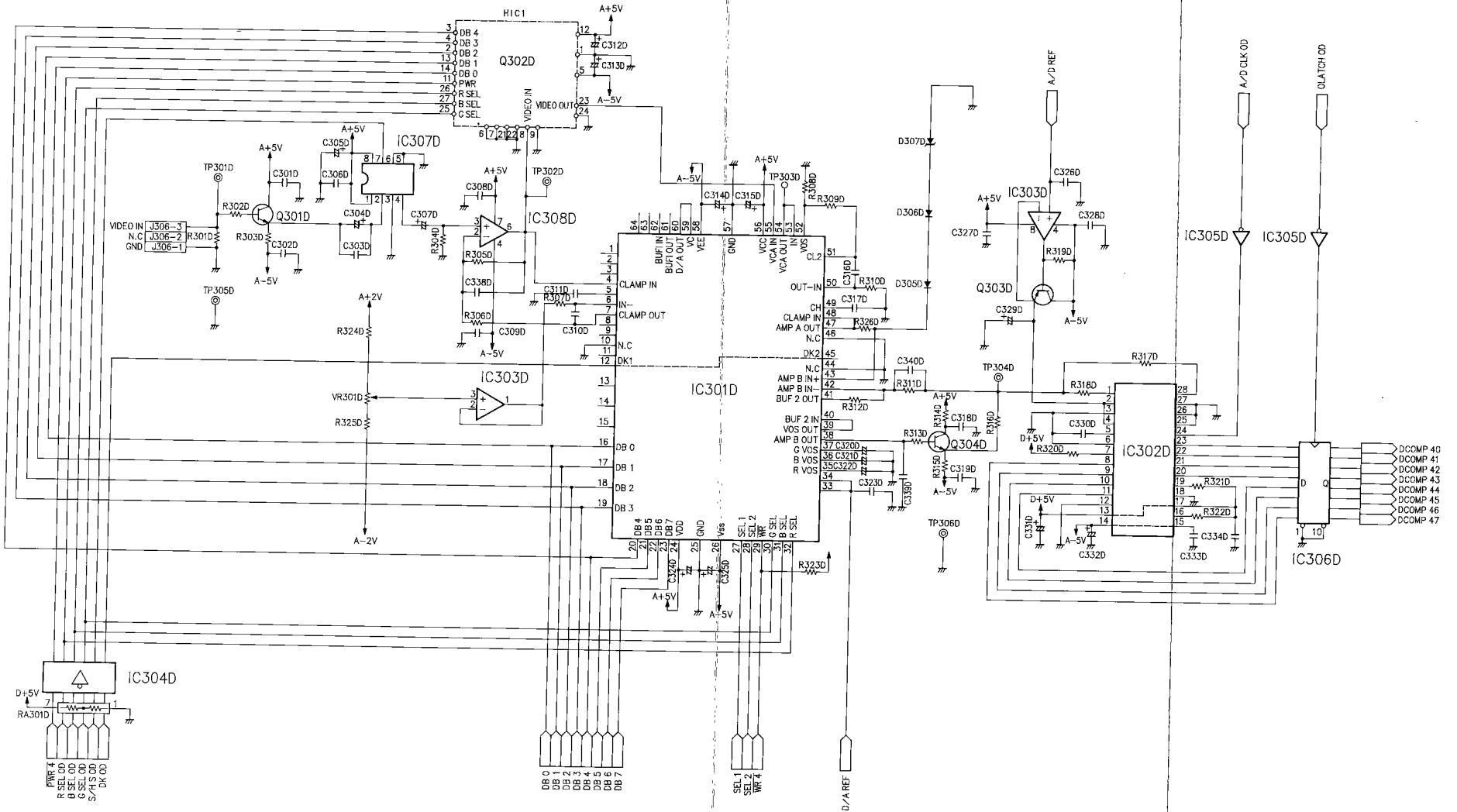
Analog processor circuit diagram (5/6)



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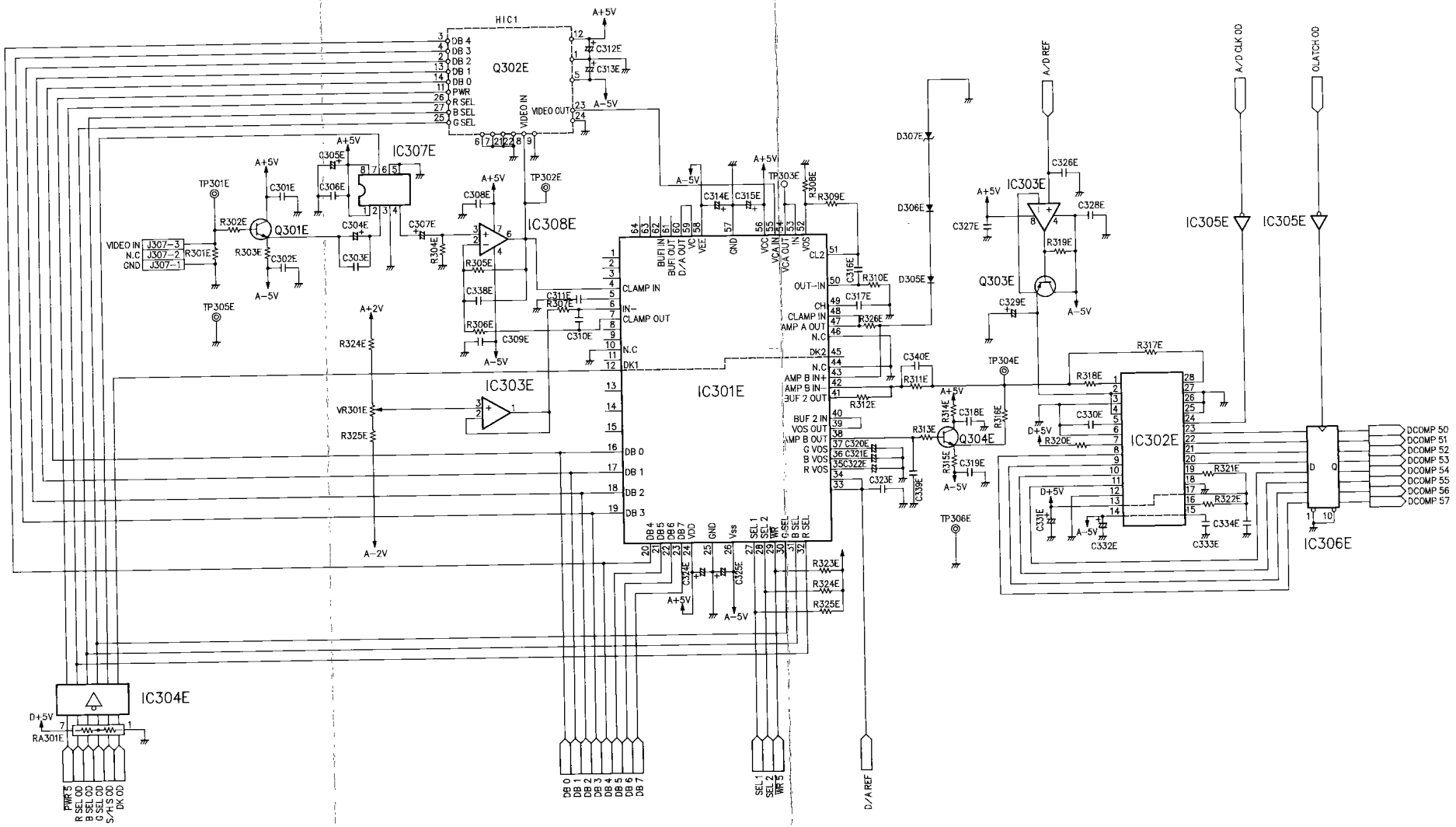
Analog processor circuit diagram (6/6)



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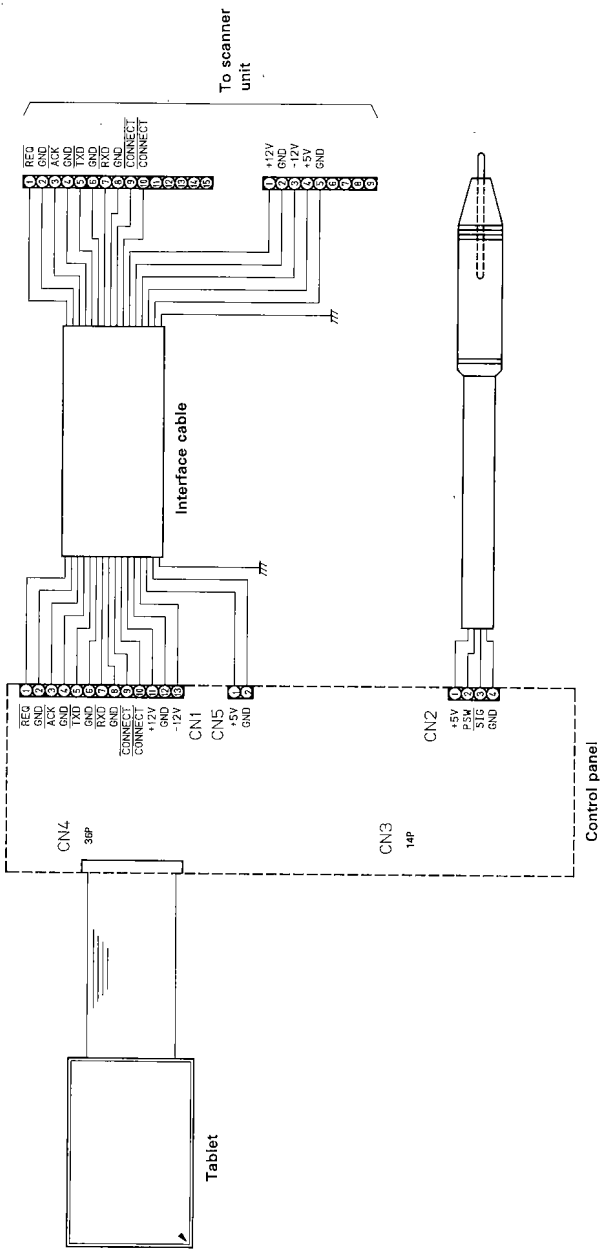
H. EDITOR GENERAL CIRCUIT DIAGRAM



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I. LIST OF SPECIAL TOOL

No.	Tool name	Tool No.	Shape	Rank*	Application
1	Test Sheet	FY9-9129-000		A	For adjustment of channel discrepany

*Rank.
A: Each serviceman is expected to carry one.
B: A group of five servicemen is expected to carry one.
C: Each workshop is expected to carry one.

J. LIST OF SOLVENTS AND MATERIALS

No.	Material name	Use	Chemical formula, mixture ratio, etc.	Source	Remarks
1.	Ethyl alcohol (Ethanol) Isopropyl alcohol (Isopropanol)	Cleaning: copyboard, glass, mirror, etc.	C_2H_2OH $(CH_3)_2CHOH$	Locally	Flammable. Use in a well-ventilated area. Avoid breathing concentrated vapor.
2.	Lubricating (low viscosity)	Lubrication points	ISO VG 68 oil ESSO Febis K68 MOBIL Vactraoil No.2 SHELL Tonna oil T68	Locally	Equivalent oil can be used. Tool No.: CK-0451 (100cc)

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COLOR LASER COPIER 500/550 PRINTER

SERVICE MANUAL

I. SPECIFICATIONS

A. Type

Copying machine	Console type
Photosensitive media	OPC drum

B. System

Reproduction	Laser beam indirect electrostatic copying
Charging	Corona
Exposure	Laser beam
Contrast adjustment	Automatic/manual
Development	Dry
Toner replenishment	Manual (600 g/container; 1.32 lb/container)
Paper feed	Automatic (two cassettes) and manual
Transfer	Corona
Separation	Claw
Cleaning	Blade
Fixing	Two 400 W heated rollers

C. Performance

Warm-up time		8 min max. (20°C, 53.8°F)
First copy (A4/Letter)		CLC 500 30 sec max. (for full color copying)
		CLC 550 32 sec max. (for full color copying)
Continuous copying		Up to 99 sheets
Copying speed		See Table 1-1.
Copy size		See Table 1-1.
Types of copy paper	Cassette feed	80 to 104 g/m² plain paper
	Manual feed	OHP film, plain paper (80 to 104 g/m²)
	Two-sided	Thick paper (104 g/m²)
Two-sided copying		CLC 500 Not possible.
		CLC 550 Possible. (manual only)
Cassette capacity		27 mm (1.06 in.) loading depth (approx. 250 sheets of 80 g/m² paper)
Copy tray capacity		Approx. 100 sheets of A3/Letter, 80 g/m² paper
Non-image area	Leading-edge blank area	8 ±2 mm (0.31 ±0.07 in.)
	Left and right blank area	2 ±1.5 mm (0.07 ±0.06 in.)
	Trailing edge blank area	2 ±1.5 mm (0.07 ±0.06 in.)

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D. Others

Operating environment	Temperature	Refer to Figure 5-1.		
	Humidity	Refer to Figure 5-1.		
	Barometric pressure	0.8 to 1 atmosphere		
Power supply	Voltage	Frequency	Serial number	Serial number
			CLC 500	CLC 550
	115 V	60Hz	CSW xxxxx	NSB xxxxx
	220 V	50Hz	DSW xxxxx	QSB xxxxx
	240 V	50Hz	ESW xxxxx	RSB xxxxx
	240 V	50Hz	FSW xxxxx	SSB xxxxx
	220 V	50Hz	GSW xxxxx	USB xxxxx
	220 V	50Hz	—	PSB xxxxx
	(Voltage allowable variation, within ±10%)			
Power consumption (Printer + Image scanner)	0.996 kW max. (Copying) 0.664 kW (continuous copying)			
	1.5 kW max.			
Noise level (1 m from copier)	Image scanner/printer unit: 55 dB (while printing) 50 dB during stand-by			
Ozone	0.1 ppm max. (avg. over 8 h)			
Dimensions	930 mm (36.6 in) wide 745 mm (28.9 in) deep 946 mm (37.2 in) high			
Weight	222 kg (488 lb) (Printer only)			

Cassette	Size	Copies/min			
		Four colors	Three colors	Two colors (B, G, R)	Single color
A3	A3 (297 × 420 mm)	2.4	2.7	3.2	6.3
A4	A4 (210 × 297 mm)	4.8	6.0	6.0	9.6
B4	B4 (257 × 364 mm)	2.4	2.7	3.2	6.3
A4R	A4 (210 × 297 mm)	2.4	2.7	3.2	6.3
B5R	B5 (182 × 257 mm)	2.4	2.7	3.2	6.3
Ledger	Ledger (279.4 × 431.8 mm)	2.4	2.7	3.2	6.3
Legal	Legal (216 × 356 mm)	2.4	2.7	3.2	6.3
Letter	Letter (216 × 279 mm)	4.8	6.0	6.0	9.6
Letter-R	Letter (216 × 279 mm)	2.4	2.7	3.2	6.3

Table 1-1 Number of copies (sheets/min)

Copier supplies storage	Paper	Seal the package to protect against humidity.
	Toner	Store under 40°C (104°F) in a dark place.

Information in this manual is subject to change with improvement or redesign of the machine.

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II. ⚠ LASER BEAM SAFETY

A. Laser Safety

The COLOR LASER COPIER has been approved as Class 1 equipment according to the radiation performance standards issued by the US Department of Health and Human Services (DHHS) in 1968.

This means that the COLOR LASER COPIER does not produce harmful laser beams.

The COLOR LASER COPIER laser scanner is completely enclosed by protective housing and external covers, so there is no possibility of laser beam leakage while the user is operating the machine.

B. CDRH Regulations

The Center for Devices and Radiological Health (CDRH) of the US Food and Drug Administration issued regulations on equipment using lasers on August 2, 1976.

The regulations apply to all equipment using lasers manufactured after August 1, 1976, and prohibit sale of equipment not complying with them within the United States.

Figure 1-1 shows the label indicating compliance with the CDRH regulations which must be attached to equipment for sale in the United States.

CANON
30-2, SHIMOMARUKO, 3-CHOME, OHTAKU, TOKYO, 146, JAPAN.
MANUFACTURED :
THIS PRODUCT CONFORMS WITH CQRH RADIATION PERFORMANCE STANDARD 21CFR CHAPTER 1 SUBCHAPTER J.

Figure 1-1

Note:
The text may vary in parts for different product models.

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C. Laser Unit Operation

Particular care should be taken when performing maintenance around the laser scanner unit to avoid inserting tools, such as screwdrivers with high reflectance, directly into the laser beam path.

Watches, rings, etc., should be removed before beginning operation to avoid the danger of reflecting the laser beam into the eyes.

The laser beam is invisible, so special care should be taken when performing maintenance or inspection under the cover to which the following label is attached.

DANGER -INVISIBLE LASER RADIATION WHEN OPEN. AVOID DIRECT EXPOSURE TO BEAM.
VORSICHT -UNSICHTBARE LASERSTRAHLUNG, WENN ABDECKUNG GEOFFNET UND SICHERHEITSVERRIEGELUNG UBERBRÜCKT NICHT DEM STRAHL AUSSETZEN.
CAUTION -INVISIBLE LASER RADIATION WHEN OPEN. AVOID EXPOSURE TO BEAM.
ATTENTION -RAYONNEMENT LASER EN CAS D'OUVERTURE EXPOSITION DANGEREUSE AU FAISCEAU.
VARO! -AVATTAESSA OLET ALTTIINA NÄKYMÄTTÖMALLE LASERSATEILYLLE ÄLÄ KATSO SÄTEESEEN.
注 意 -ここを開くとレーザー光がでます。
レーザー光を直接見たり、触れたりしないでください。

Figure 1-2

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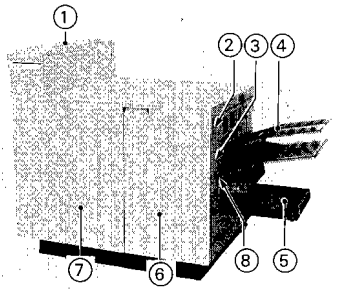
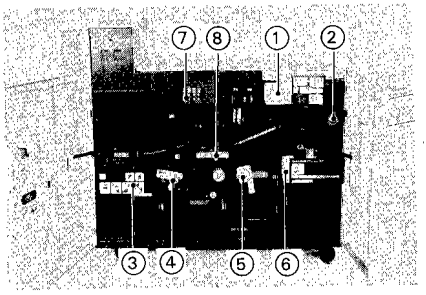
III. PART NAMES

A. External View



① Hopper cover
② Power switch
③ Control key
④ Copy tray
⑤ Cassettes
⑥ Right front door
⑦ Left front door
⑧ Manual feed selecor lever

Figure 1-3



① Silicone oil container
② Fixing unit knob
③ Waste toner receptacle
④ Transfer drum release lever
⑤ Registration roller release lever
⑥ Waste oil bottle
⑦ Display panel
⑧ Transfer drum release handle

Figure 1-4

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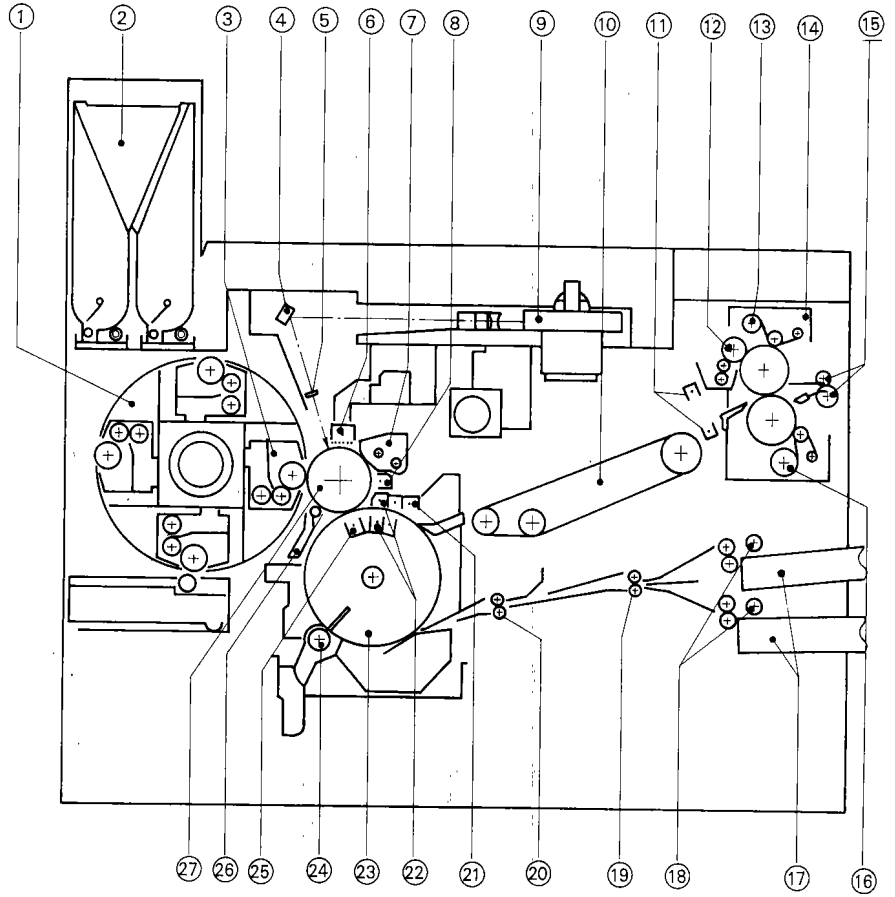
B. Cross Section



① Developing assembly turret
② Hoppers
③ Developing unit
④ Mirror
⑤ Dust-proofing glass
⑥ Primary corona unit
⑦ Drum cleaning unit
⑧ Pre-cleaning corona unit
⑨ Laser scanner (prism-mirror/motor) unit
⑩ Feeder
⑪ Pre-fixing corona unit
⑫ Oil-applying roller
⑬ Upper-roller cleaning belt
⑭ Fixing unit
⑮ Delivery rollers
⑯ Lower-roller cleaning belt
⑰ Cassettes
⑱ Pick-up rollers
⑲ Feed rollers
⑳ Registration rollers
㉑ Separation corona unit
㉒ Static charge eliminating corona
㉓ Transfer drum
㉔ Cleaning brush
㉕ Transfer corona unit
㉖ Side cleaning unit
㉗ Photosensitive drum

Figure 1-5

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I. IMAGE FORMATION

A. Outline

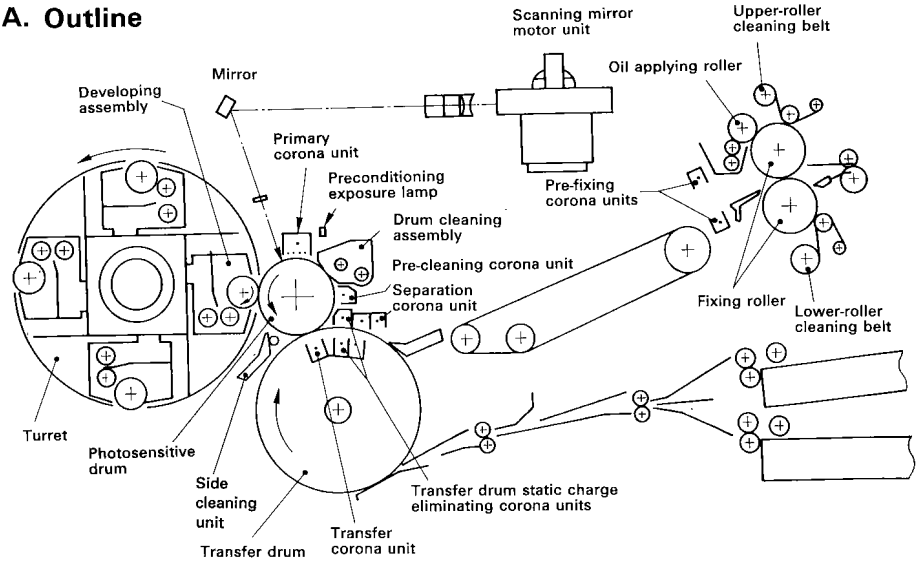

Figure 2-1

The copying machine uses a seamless photosensitive drum with the construction shown in Figure 2-1.

The external photosensitive layer of the drum is an organic photoconductor (OPC) material, while the core (base cylinder) is conductive aluminum.

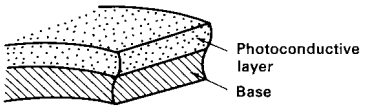

Figure 2-2

The differences between the process of this printer and that of a monochrome printer are described below.

Color documents are exposed to light, and the light reflected from them is separated into the three additive primary colors using color separation filters. The light passing through each filter is sensed by photocells of a charge-coupled device (CCD) unit. The electronic signals (data) from the CCD switch the laser beam ON and OFF as it is repeatedly scanned across the photosensitive drum. The image (areas struck by laser light) is developed using toner of color complementary to the filter (one scan-development cycle per color; up to four times). Each toner image is transferred in turn to the paper and finally fixed to make it permanent.

The copy paper is held by the transfer drum and rotated into contact with the photosensitive drum once for each color of toner deposited on the paper.

The transfer drum is twice the diameter of the photosensitive drum, so the photosensitive drum rotates twice for each time the transfer drum rotates.

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The image formation process can be roughly divided into the following eight steps.

Step 1. Pre-conditioning exposure
Step 2. Primary corona (–)
Step 3. Laser exposure
Step 4. Development (AC + DC bias)
Step 5. Transfer (+)
Step 6. Separation
Step 7. Drum cleaning
Step 8. Fixing

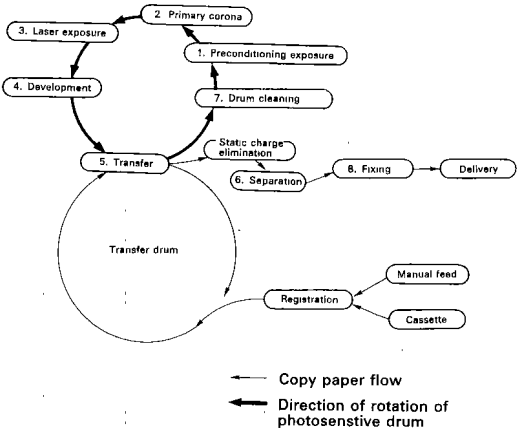

Figure 2-3

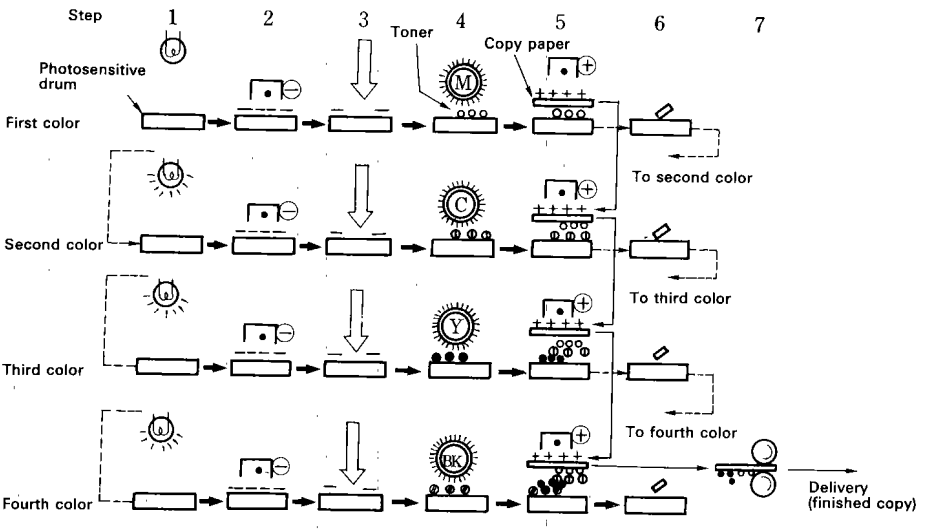

Figure 2-4

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B. Electrostatic Latent Image Formation Stage

This stage consists of three steps which are performed to produce a pattern of negative charges on the areas of the photosensitive drum corresponding to white areas of the document, and no negative charges in areas of the drum corresponding to black areas of the document.

The image on the drum formed by the negative charges is called the electrostatic latent image (because it is invisible).

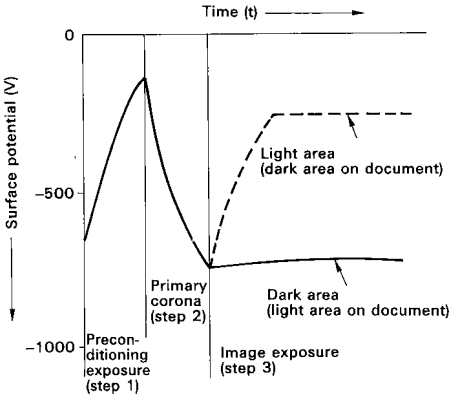

Figure 2-5

C. Step 1. Preconditioning exposure

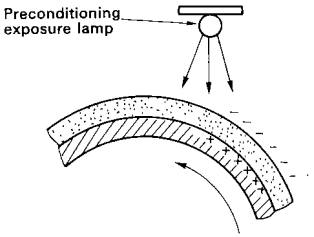

Figure 2-6

As the first step, the photosensitive drum is exposed to light from the preconditioning lamp to eliminate any charges remaining on the drum surface. This prevents copy density irregularities.

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D. Step 2. Primary corona

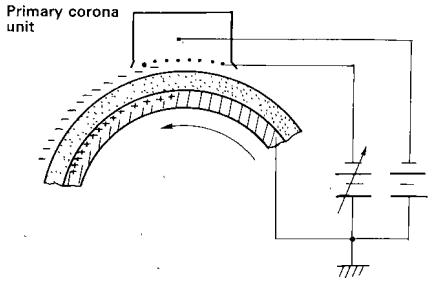

Figure 2-7

The primary corona discharge (negative) produces a uniform negative charge over the entire surface of the drum. This establishes the primary potential.

The drum surface potential is determined by the potential on the grid, so a bias voltage is applied to the grid to maintain a constant drum surface potential.

E. Step 3. Laser exposure

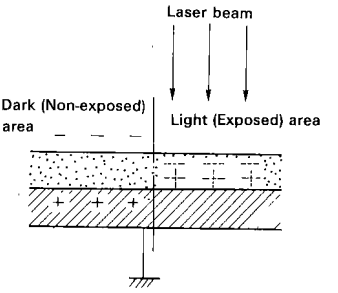

Figure 2-8

The laser beam is directed (scanned) onto the drum surface in areas that should be reproduced as dark (black or color toner). Charges are neutralized where the light strikes, leaving a latent image of zero (or reduced) charge on a background of the original negative charges.

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F. Step 4. Development

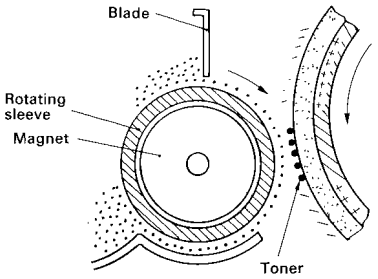

Figure 2-9

Development is the process of turning the electrostatic latent image on the drum surface into a visible image using toner.

In the Color Laser Copier, negatively-charged toner is used, the same polarity as the charge applied by the primary corona. For this reason, the toner will be attracted to any area of the drum illuminated by the laser (i.e., it will be attracted to light areas) where the charges have been neutralized.

The developing assembly is shown in Figure 2-9. It consists of a developing cylinder and non-magnetic blade. The developing cylinder consists of a fixed magnet and a sleeve which rotates around it.

The developer consists of toner (main ingredients: resin and coloring agent) and iron powder (the carrier) mixed in a fixed ratio.

Friction with the rotating sleeve gives the toner a negative charge and the iron powder a positive charge.

The developer forms a "brush" on the sleeve due to the field of the fixed magnet, and is skimmed to a layer of uniform thickness by the blade.

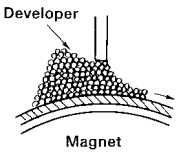

Figure 2-10

Both AC and DC bias voltages (negative component) are applied simultaneously to the developing cylinder (developing bias). The DC bias is negative, so the negative excursion of the waveform is greater than the positive.

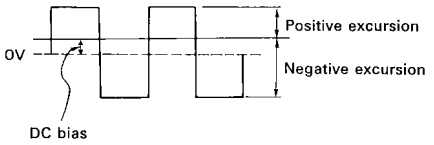

Figure 2-11

During development, toner is attracted to areas of the drum struck by the laser beam by the combined effect of the drum surface potential and the negative component of the developing bias. Excess toner is removed from the exposed areas of the drum, and all toner is removed from non-exposed areas by the positive component of the developing bias and charges on the drum surface.

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G. Step 5. Transfer

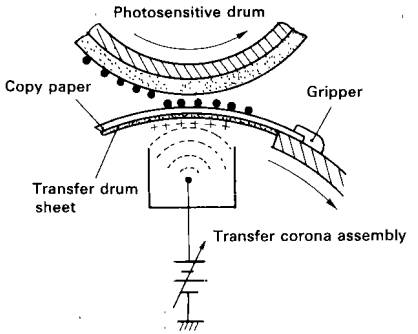

Figure 2-12

The sheet of paper onto which toner is to be transferred to make a copy is first wrapped around the transfer drum, held in place by grippers. (No image is formed on the first 8 mm of the copy leading edge.) The area under the paper is an insulating sheet, and a corona unit inside the transfer drum applies a positive charge to the back of the sheet.

The charges attract toner from the photosensitive drum to the paper, and also hold the paper firmly to the transfer drum.

H. Step 6. Separation Corona Unit

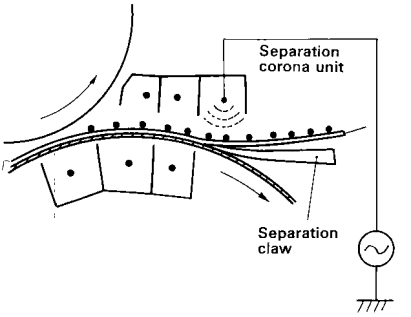

Figure 2-13

A separation claw separates the copy paper from the transfer drum. However, the copy paper is held to the transfer drum by electrostatic attraction. An AC corona neutralizes the charges and enables easy removal of the copy paper from the transfer drum.

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I. Step 7. Drum cleaning

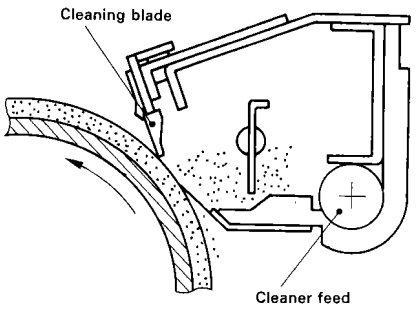

Figure 2-14

To leave the drum surface clean for the next copy, any toner remaining on the surface after transfer is removed by the cleaning blade and collected by the sweeper strip and conveyed toward the front by the cleaner feed screw to the waste toner receptacle.

J. Step 8. Fixing

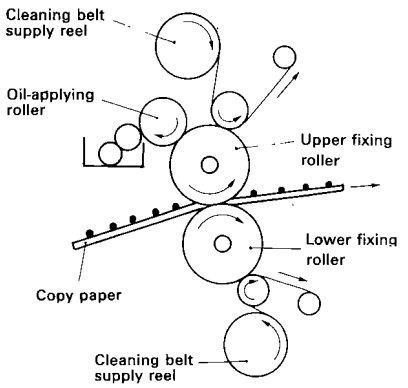

Figure 2-15

After all toner-transfer operations, the copy paper is sent to the fixing assembly. The copy paper is heated and pressed as it passes between the two fixing rollers. The toner on the copy paper (up to four colors) is melted and mixed to reproduce the original colors, and pressed firmly onto the paper to make a permanent copy.

Silicone oil is applied periodically to the upper fixing roller to prevent toner from sticking to it (offsetting) as a copy passes through. Both fixing rollers are cleaned by contact with a cleaning belt impregnated with silicone oil. The belt is advanced slowly by the winding mechanism.

The fixing roller is in contact with the cleaning belt impregnated with silicone oil; the roller is cleaned by the belt, which is taken up while changing the point of contact.

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II. AUXILIARY PROCESSES

A. Static Charge Eliminators

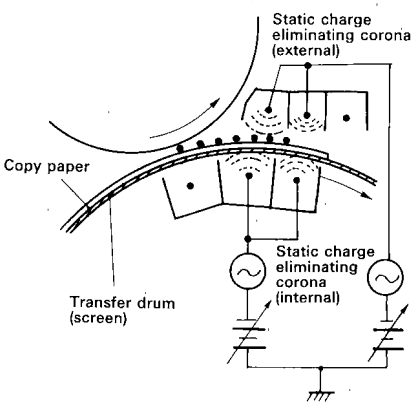

Figure 2-16

Charges remaining on the front of the copy paper after transfer are eliminated by an AC corona with a negative DC bias to stabilize the toner image. (The toner particles are loose on the paper, and a sudden discharge of residual toner would likely scatter toner at random.)

The internal static charge eliminating corona (AC corona with negative DC component) neutralizes the positive charges that were applied to the back of the sheet of the transfer drum by the transfer corona.

B. Pre-cleaning corona unit

The pre-cleaning corona unit serves to limit the fluctuations in the drum surface potential occurring after transfer, thereby preventing formation of paper traces.

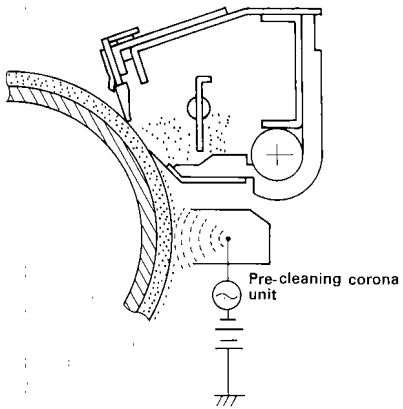

Figure 2-17

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C. Pre-fixing Corona Units (CLC 500 ONLY)

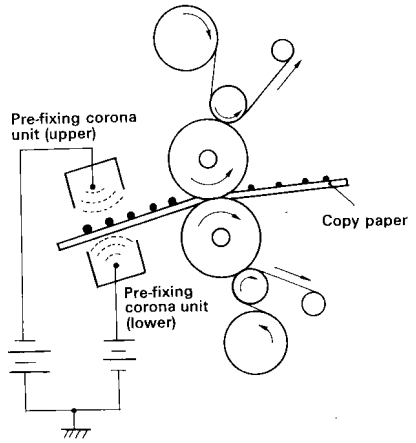

Figure 2-18

Prior to fixing, a negative corona discharge onto the front of the copy paper and a positive corona onto the back prevent the toner on the paper from moving around due to residual charges. Up to four layers of toner can be deposited onto the copy paper. Without these coronas the toner could easily move around (out of position) when the paper reached the fixing rollers, which would seriously distort the image.

D. Side Cleaning Assembly

The side cleaning assembly is used to prevent adhesion of toner from the photosensitive drum or the developing assembly to copy paper or the transfer drum.

E. Ozone Filter

There is a catalytic filter in the exhaust fan unit which decomposes the ozone produced by corona discharge and prevents it from escaping from the copying machine.

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III. LIMITATIONS

A. Outline

There are many difficulties in making high-quality color prints by an electrophotographic process, some of which are discussed below. The Color Laser Copier has many design features to minimize these difficulties, and they are very successful.

However, the prints are not of the same quality as those in high-quality printed material, such as magazine illustrations and photographs.

Each product has its own advantages and limitations, and users of the copying machine should be made aware of the capabilities of the machine.

B. Characteristics

1. OPC

The sensitivity of the OPC used for the photosensitive drum is subject to the environment in which the machine is used and changes over time.

2. Reflectance of Toner

The ideal toners, representing the primary colors (yellow, magenta, and cyan), should absorb 100 percent of the spectrum of their complementary colors and reflect 100 percent of the rest. Such toners, however, are not available at present.

3. Dry Electrostatic Photography and Gradation

As shown in Figure 2-19, it is impossible to reproduce the density of the original document exactly the same because of the characteristics of photosensitive material and toner.

The powder toner, further, limits the details of the image to the diameter of its individual particles.

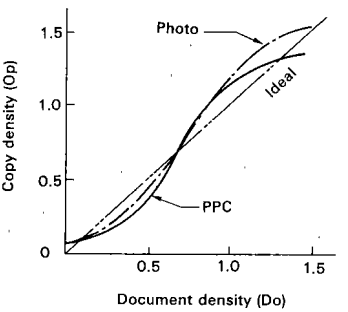

Figure 2-19

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I. BASIC OPERATIONS

A. Functional Units

Operations can be divided into the functions of three major systems: paper feed and delivery, image formation, and control systems.

The image scanner is connected to the printer by a cable.

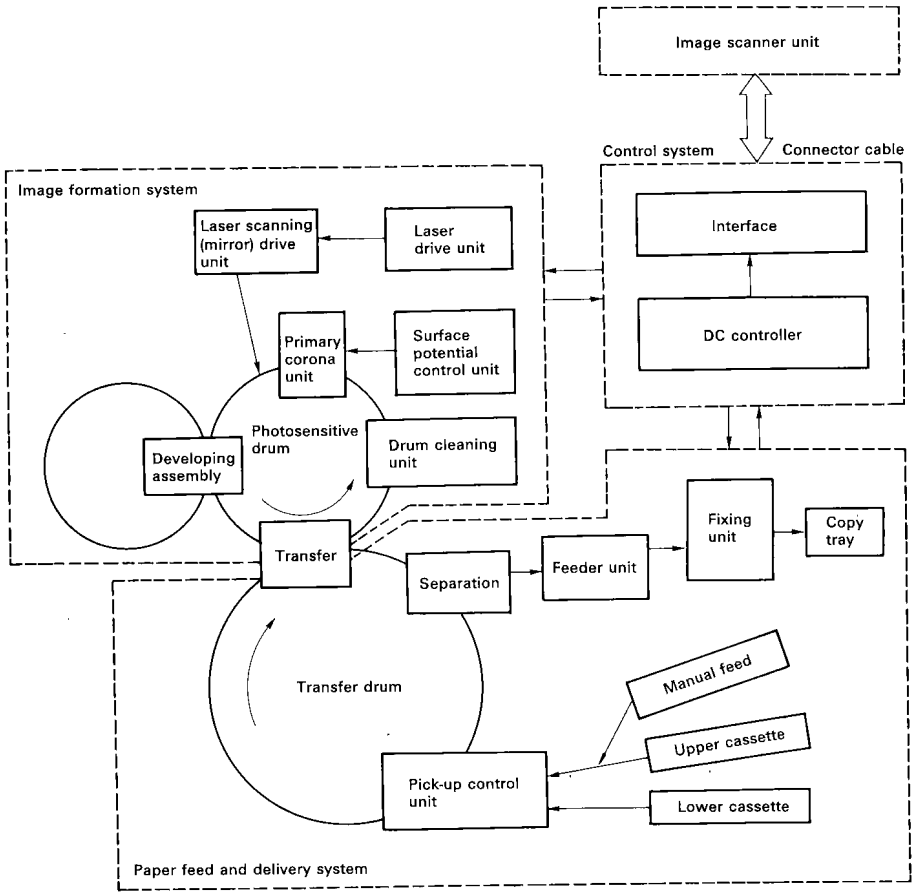

Figure 3-1

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B. Electrical Circuits

The principal electrical functions of the printer are controlled by a microprocessor on the DC controller PCB.

As directed by software in the memory of the microprocessor, input signals from sensors, operation keys, or other PCBs are read in, and the necessary control signals are output to drive loads such as motors, solenoids, and lamps, or to circuits on other PCBs at the appropriate times.

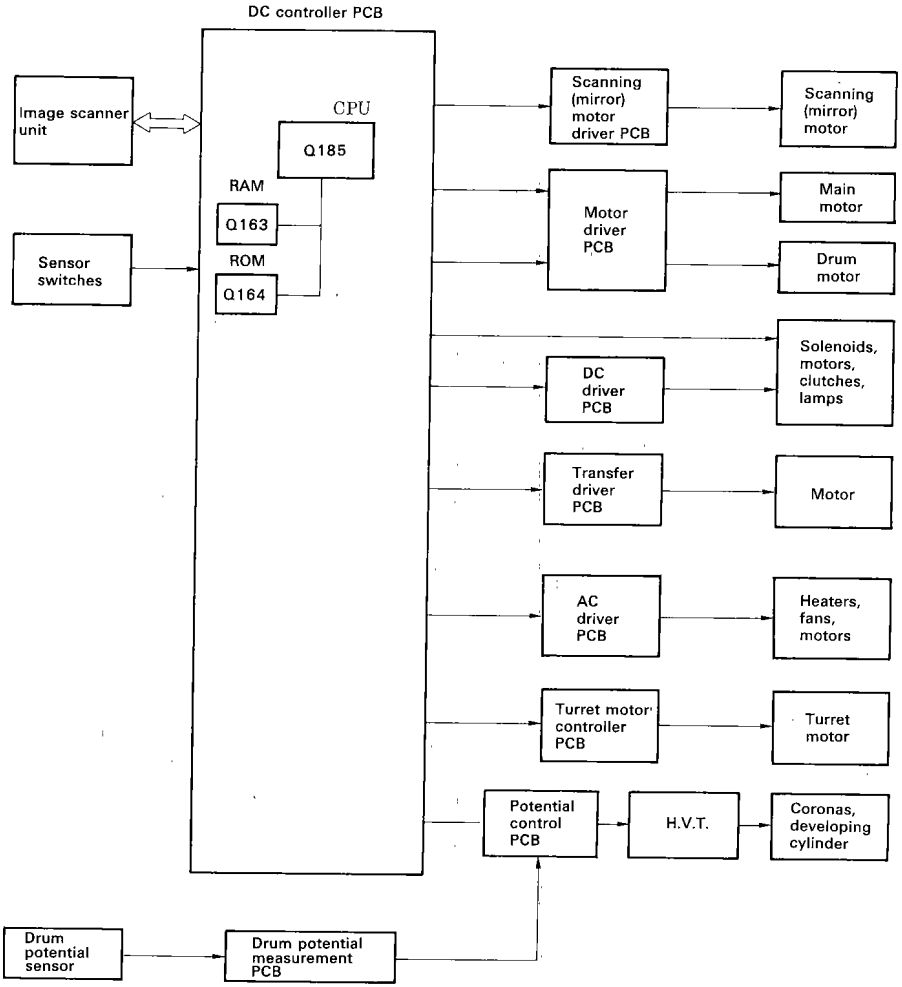

Figure 3-2

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C. DC Controller Inputs

1. DC Controller Inputs 1

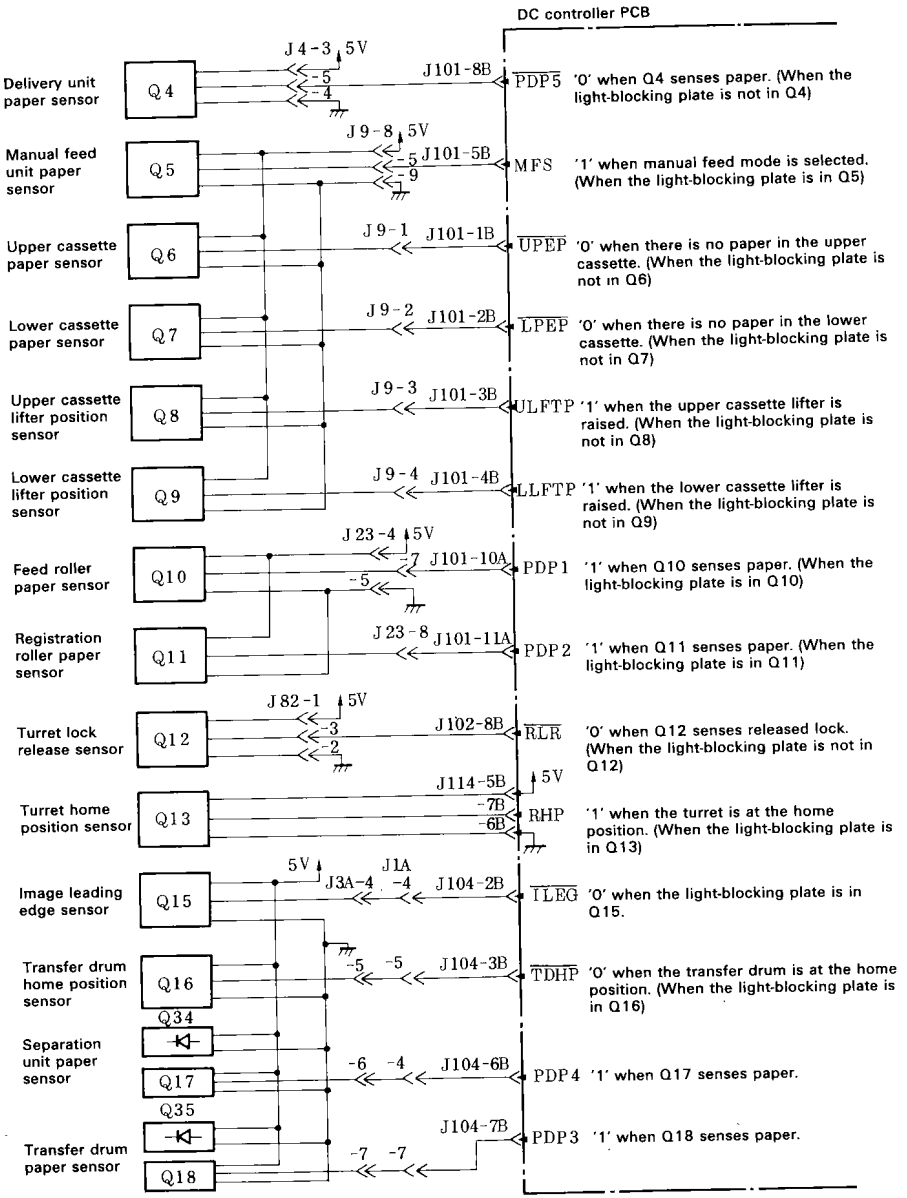

Figure 3-3

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2. DC Controller Inputs 2

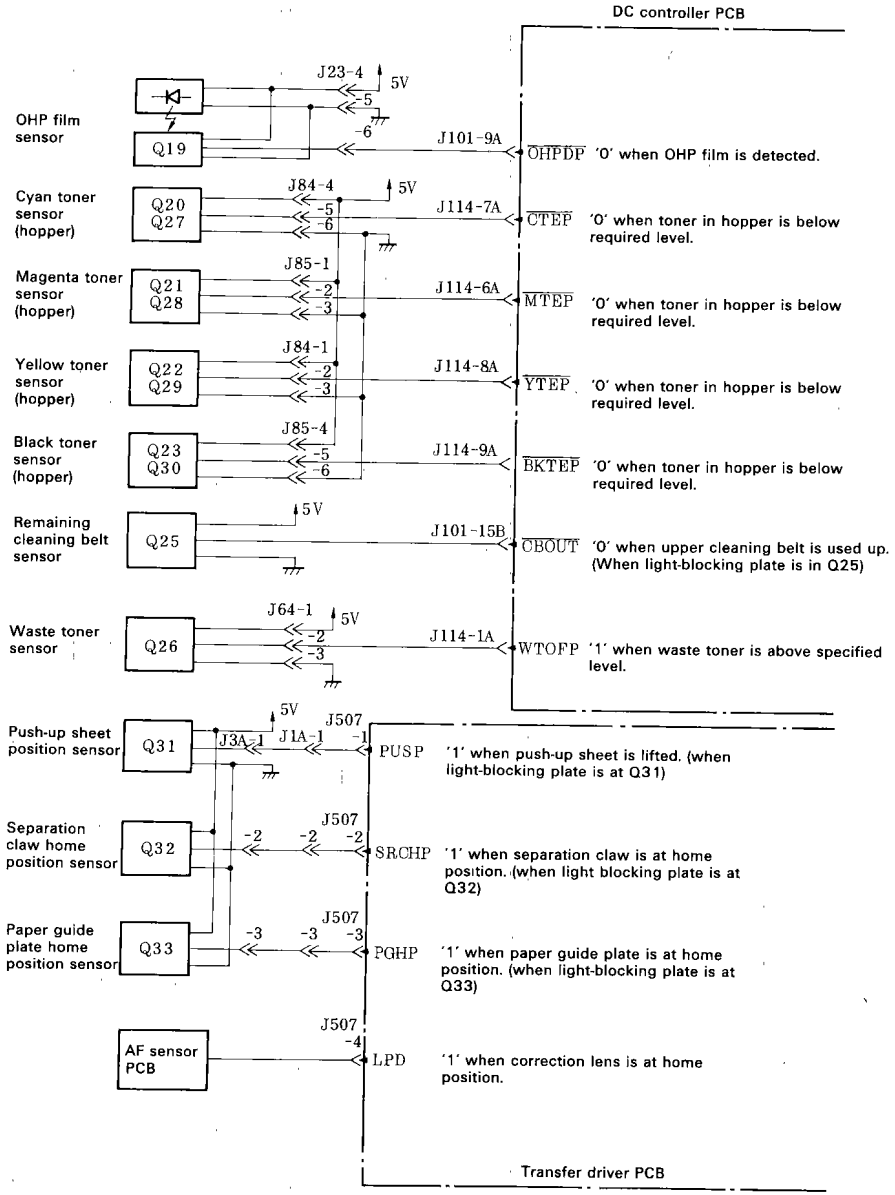

Figure 3-4

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3. DC Controller Inputs 3

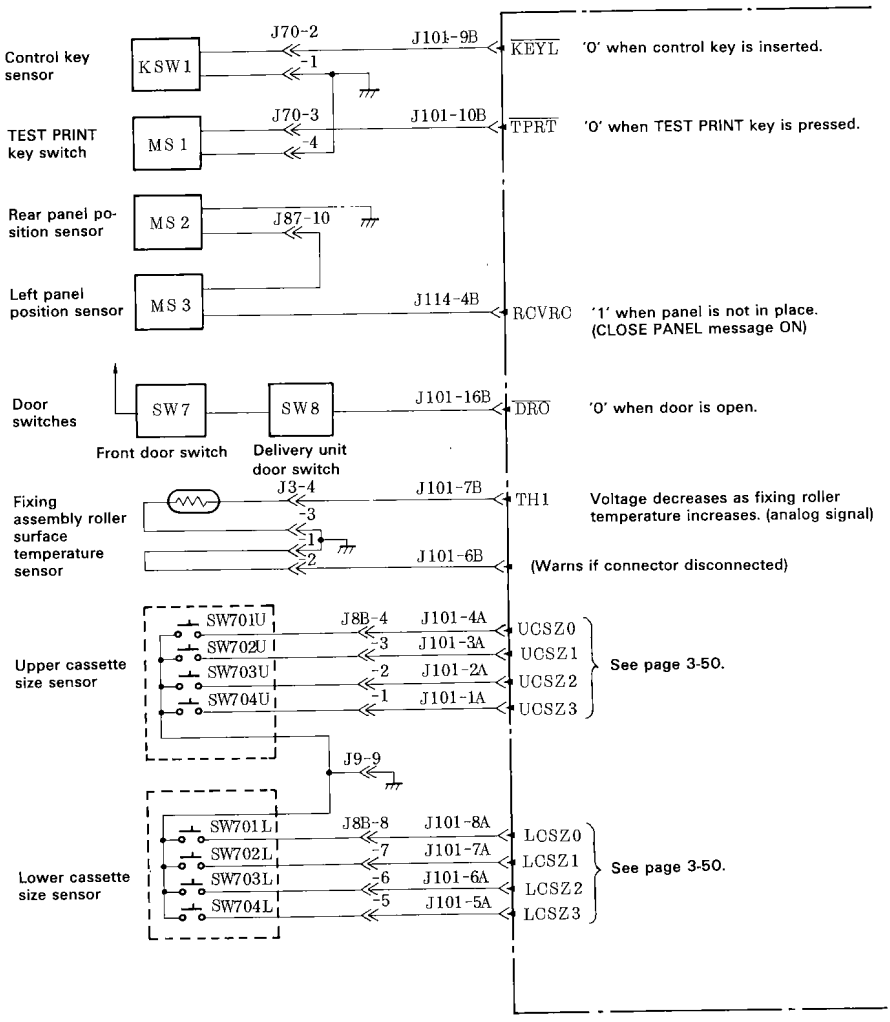

Figure 3-5

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4. DC Controller Inputs 4

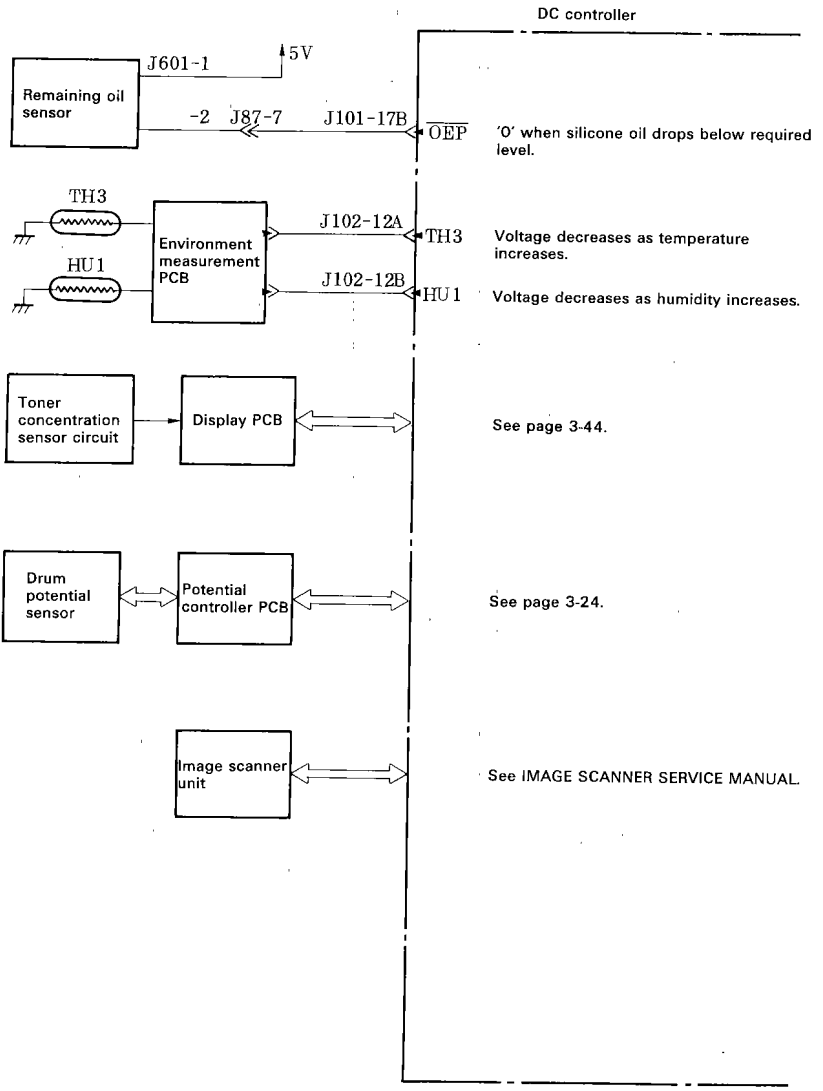

Figure 3-6

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D. DC Controller Outputs

1. DC Controller Outputs 1

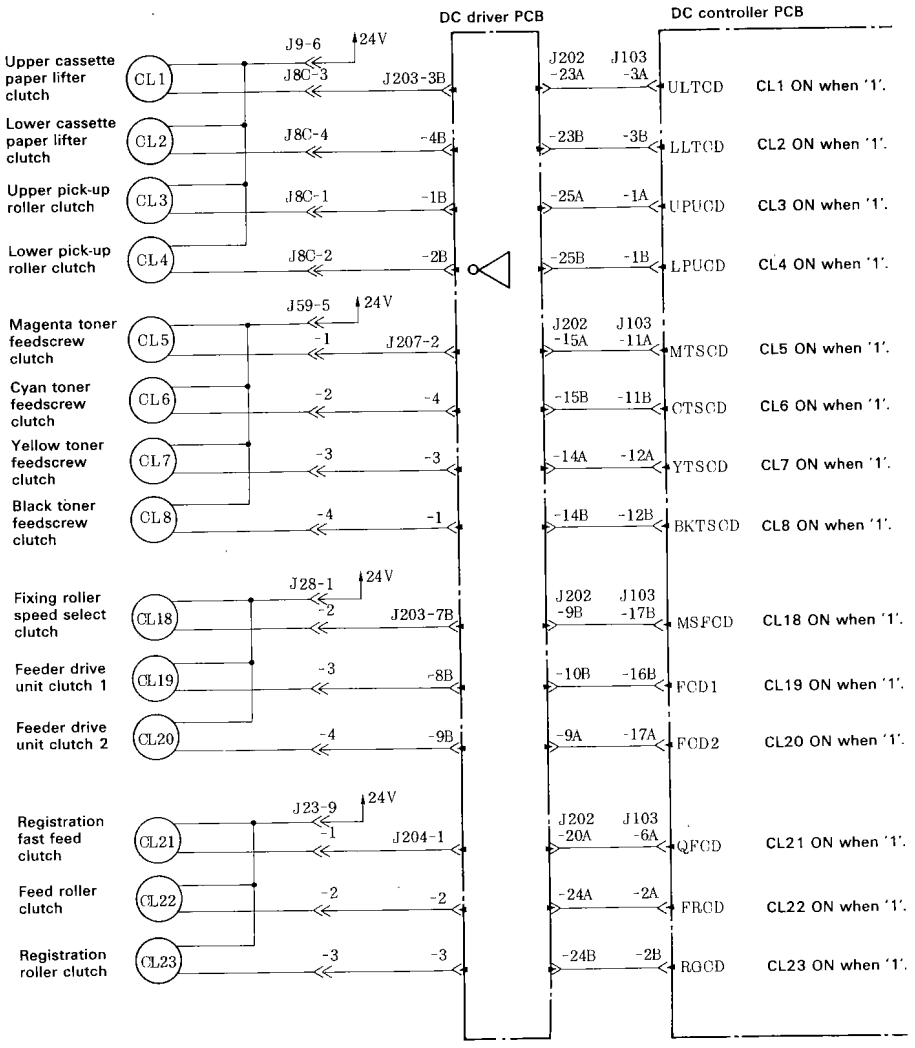

Figure 3-7

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2. DC Controller Outputs 2

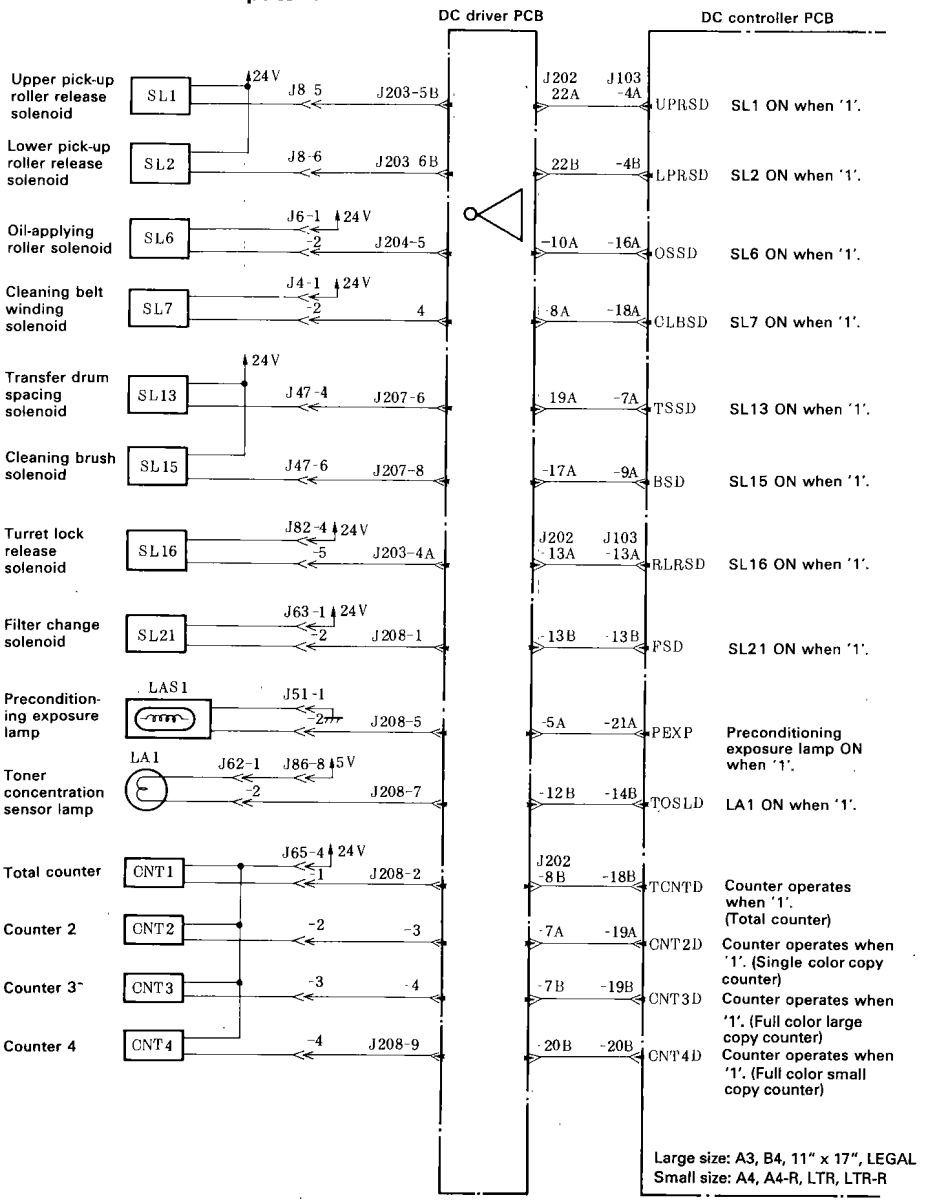

Figure 3-8

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3. DC Controller Outputs 3

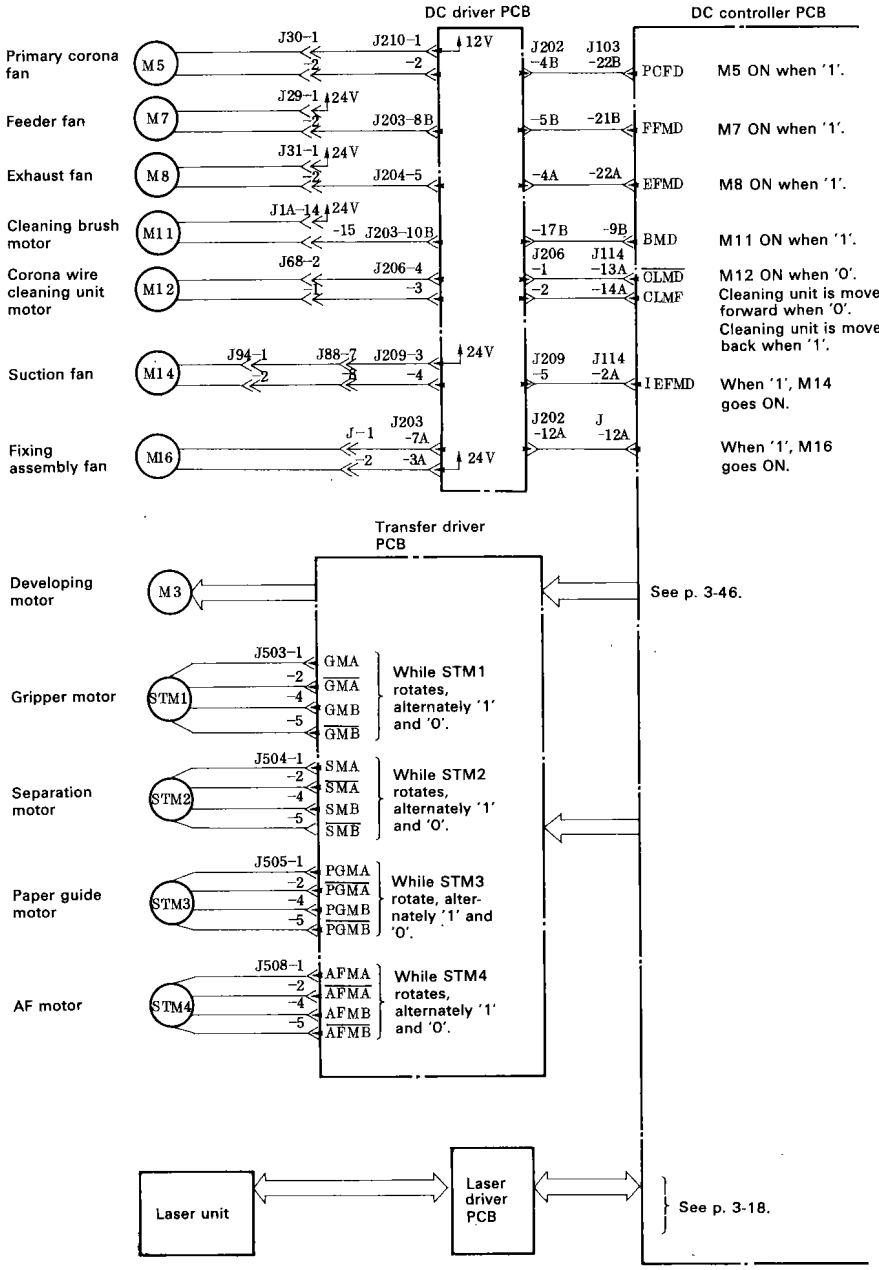

Figure 3-9

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4. DC Controller Outputs 4

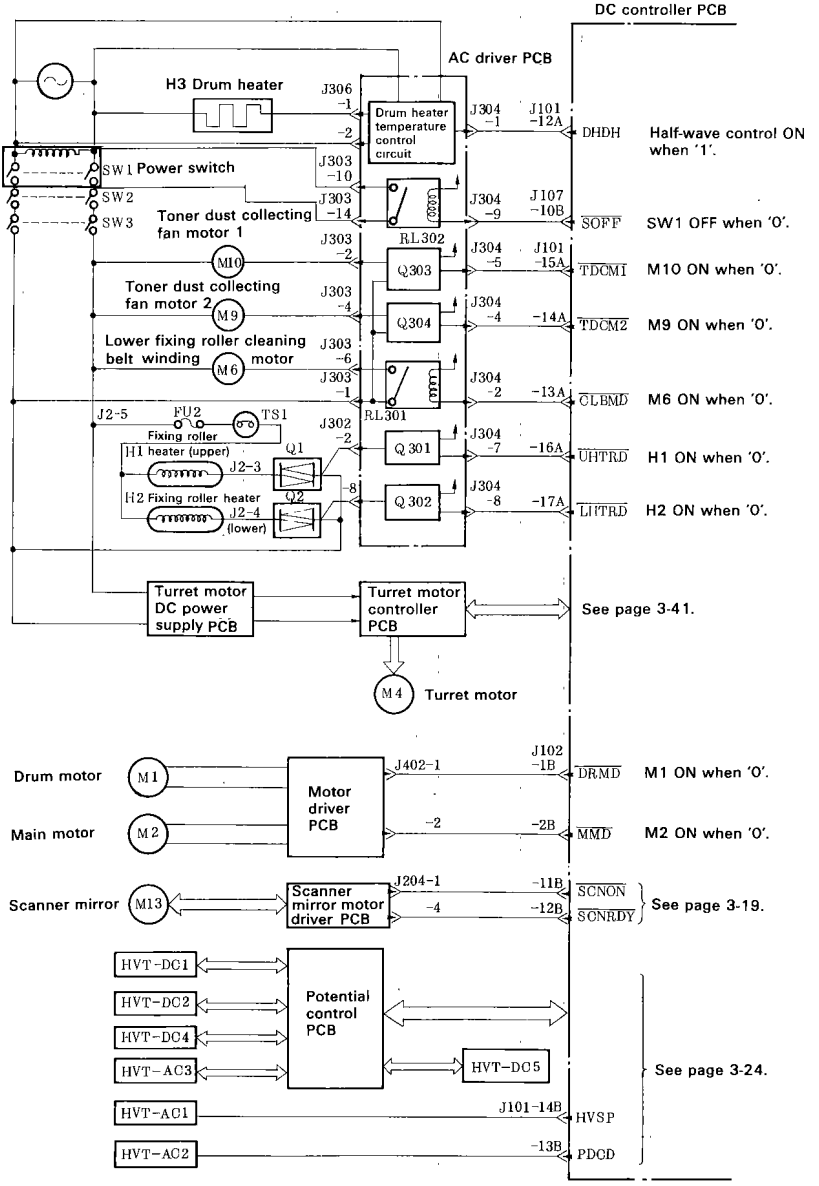

Figure 3-10

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E. Main Motor and Drum Motor Control

1. Outline

Figure 3-11 shows the circuit that controls the main motor and drum motor and has the following functions:

1 Turns the drum motor ON and OFF.
2 Controls the rotation speed of the drum motor.
3 Turns the main motor ON and OFF.
4 Controls the rotation speed of the main motor.

The drum motor and main motor are DC motors equipped with a built-in clock pulse generator, which generates clock pulses corresponding to the revolution of the motor. The speed control PCB uses these clock pulses to control the rotation speed of the motors.

2. Drum Motor

When the drum motor drive signal ($\overline{DRMD}$) goes '0', the switch PCB goes ON and the drum motor starts to rotate.

When the drum motor rotates, clock pulses (DMCLK) corresponding to the revolution of the motor are generated and sent to the speed control PCB.

The speed control PCB, in turn, varies the control signals sent to the drive PCB so as to keep the rotation of the drum motor constant at all times.

The motor drive PCB does not vary the voltage applied to the motor; instead, it turns the power ON and OFF at short intervals to control the revolution while keeping the voltage constant.

LED1 remains ON while the drum motor is rotating at the specified revolution and, at the same time, the drum PLL signal (DPLL; '0') is sent to the DC controller.

The clock pulses (DMCLK) of the drum motor are sent to the DC controller PCB and used to detect problems in the drum motor.

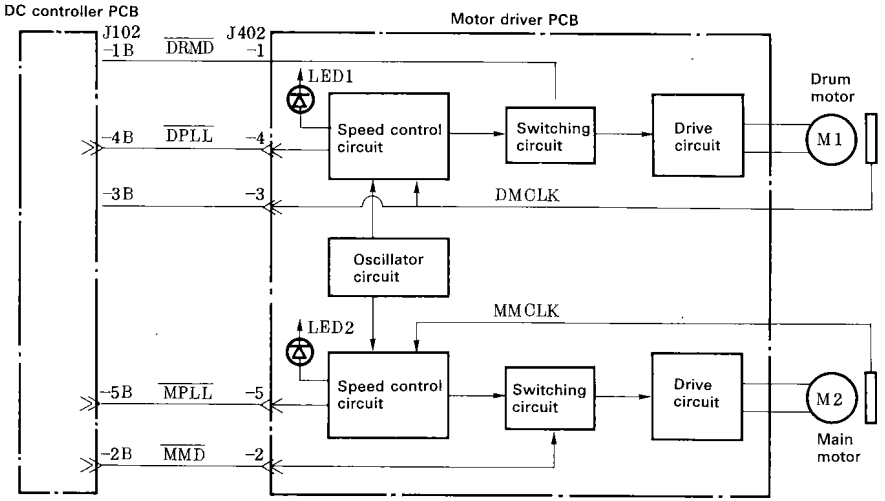

Figure 3-11

3. Main Motor

The main motor control PCB operates the same way as the drum motor control PCB.

LED2 remains ON while the main motor is rotating at the specified revolution.

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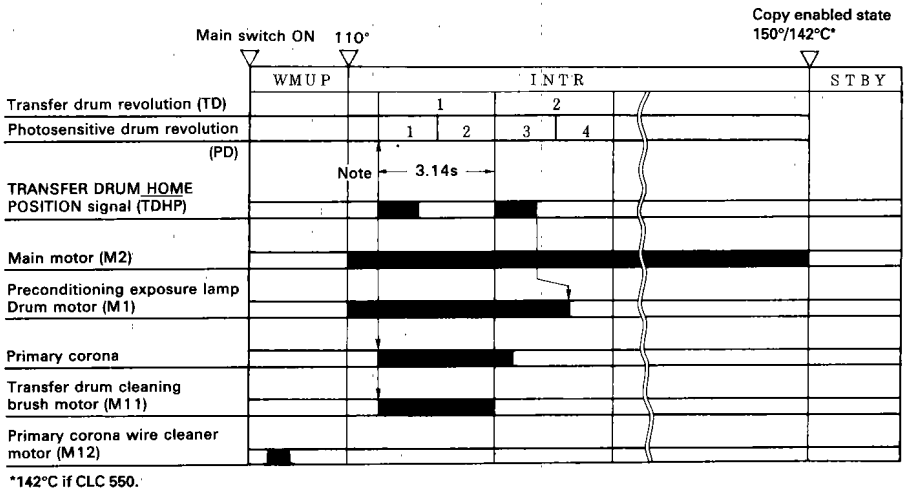
F. Basic Sequence of Operations

1. Outline

Timing of printing operations is based on the TRANSFER DRUM HOME POSITION signal.

The diameter of the transfer drum is twice that of the photosensitive drum, so the latter rotates twice during one rotation of the former.

2. Operations at Power-On



*142°C if CLC 550.

Figure 3-12

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Period		Purpose	Remarks
WMUP (WARM-UP)	Period from setting main switch ON until fixing roller surface temperature reaches 110°C.	To allow fixing rollers to heat up.	• The warm-up period varies with the initial temperature of the fixing rollers. • If the temperature of the fixing rollers is below 80°C, the primary corona wire is cleaned.
INTR (INITIAL ROTATION)	Period from fixing roller surface temperature reaching 110°C until reaching 150°C/142°C.	To complete warm-up and to stabilize sensitivity of photosensitive drum in preparation for printing.	• Transfer drum rotates twice, then stops.
STBY (STANDBY)	Period from completion of INTR until COPY START key is pressed or main switch is set OFF.	Printer is ready for operation.	

Table 3-1

Note:
The position at which the transfer drum stops is not fixed; so when it rotates, the falling edge of the TRANSFER DRUM HOME POSITION signal is used as the indication of the home position.

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3. Copying Basic Sequence

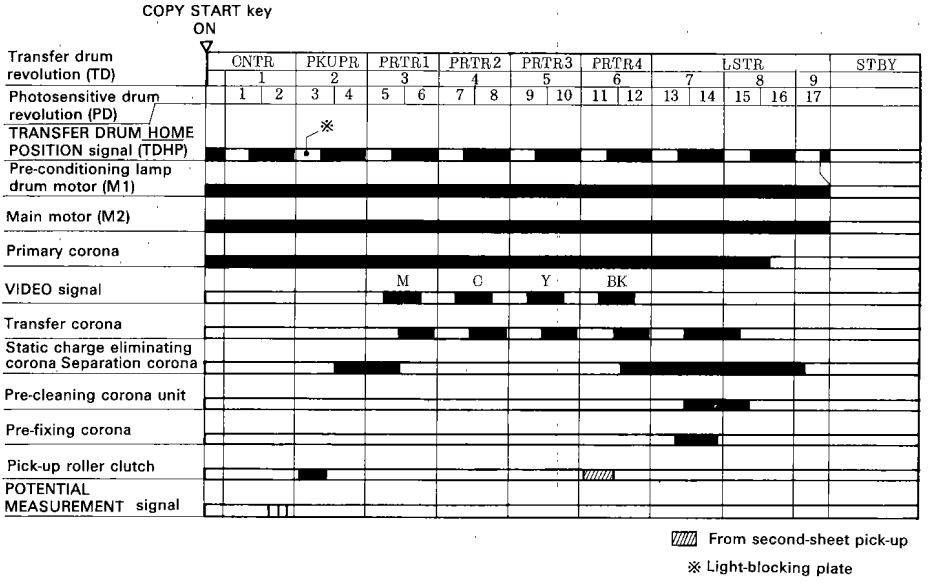

Figure 3-13 A4/letter, full color, 1 copy (1-rotation mode)

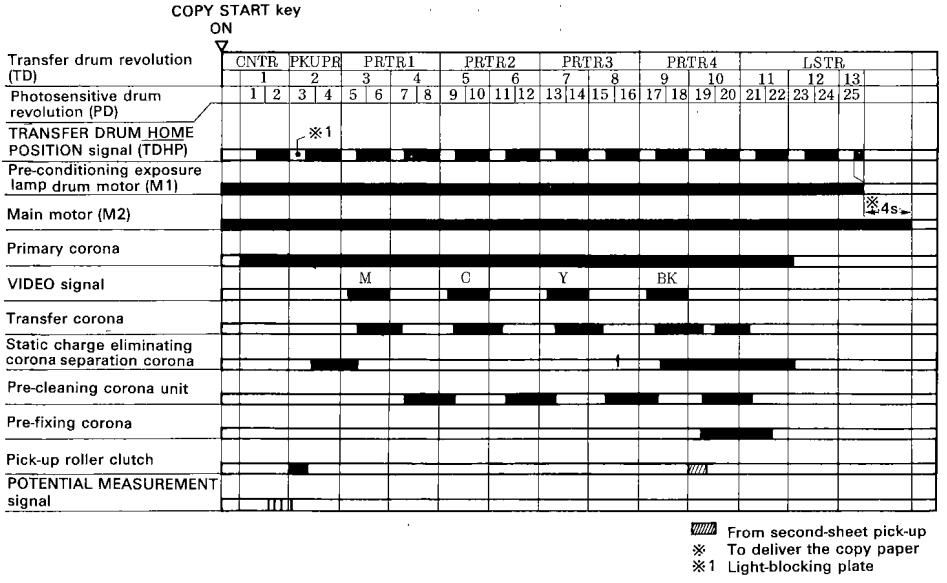

Figure 3-14 Non-A4, Letter, full color, 1 copy (2-rotation mode)

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Period		Purpose	Remarks
CNTR (CONTROL ROTATION)	Period from pressing COPY START key until end of first transfer drum rotation.	• For measurement and adjustment of drum surface potential. • For stabilizing drum sensitivity in preparation for copying.	• If the developing assembly turret is not at the home position, it is returned to the home position. • If potential adjustment has not been performed, copying operation begins with PKUPR.
PKUPR (PICK-UP ROTATION)	Period from completion of CNTR until copy paper is held firmly by transfer drum grippers.	• For clearing static changes from transfer drum surface. • For feeding copy paper to transfer drum to receive toner images.	
PRTR 1, 2, 3, 4 (PRINTING ROTATIONS 1, 2, 3, 4)	Period from end of PKUPR until all toner is transferred to the copy paper.	For generating electrostatic latent image by laser and developing visible toner image (for all colors).	
LSTR	Period from completion of PRTR until main motor stops.		

Table 3-2

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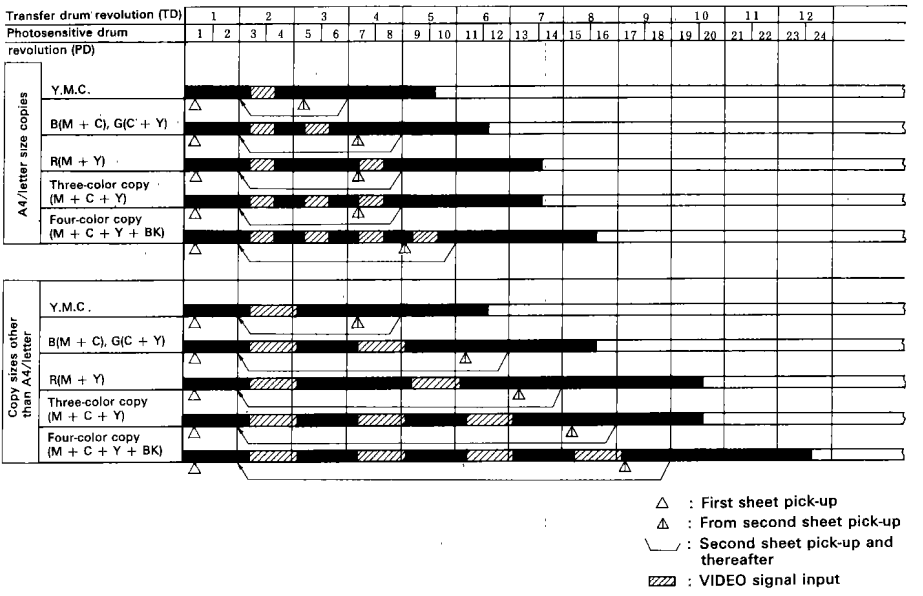
Transfer drum revolution (TD)
Photosensitive drum revolution (PD)
A4/letter size copies
Y.M.C.
B(M + C), G(C + Y)
R(M + Y)
Three-color copy (M + C + Y)
Four-color copy (M + C + Y + BK)
Copy sizes other than A4/letter
Y.M.C.
B(M + C), G(C + Y)
R(M + Y)
Three-color copy (M + C + Y)
Four-color copy (M + C + Y + BK)
△ : First sheet pick-up
△ : From second sheet pick-up
: Second sheet pick-up and thereafter
: VIDEO signal input

Figure 3-15 Operations for continuous copying (CNTR not included)

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II. EXPOSURE SYSTEM

A. Laser Scanner

The laser scanner consists of a laser unit which generates the laser beam, and a eight-facet prism mirror which rotates and repeatedly scans the laser beam across the photosensitive drum.

The video signals (VDO0 to VDO7) sent from the image scanner unit to the printer are converted into LD laser intensity signals by the controller PCB. The LD signal both switches the laser (semiconductor type) ON and OFF and sets its intensity. The collimator turns the laser beam into a narrow parallel beam of elliptical cross section, and the cylindrical lens converts this to a flat belt-shaped parallel beam. This laser beam is reflected by successive faces of the rotating prismatic scanning mirror, passes through the imaging lens, and sweeps repeatedly across the photosensitive drum, one such horizontal scan per face.

Each time the laser is switched ON, it causes the removal of electrostatic charges from a minute area of the drum. Because the mirror is always turning, each time the laser goes ON it strikes a different place. By switching it ON rapidly, adjacent areas can be treated to build up image areas, the electrostatic latent image which is subsequently developed by toner.

The Color Laser Copier is equipped with a laser auto focus (AF) mechanism.

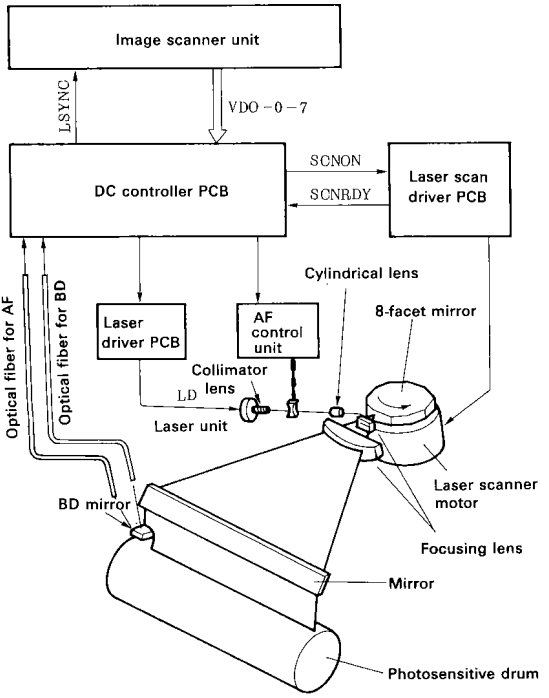

Figure 3-16

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B. Laser Driver Circuit

1. Outline

The circuit shown in Figure 3-17 produces the LASER INTENSITY CONTROL signal, LD, to suit the information supplied by the 8-bit video signal (VDO-0 to VDO-7) from the image scanner unit. Its main functions are as follows.

1 To set the laser intensity in response to the video signal
2 To switch the laser ON/OFF
3 To control laser unit temperature

2. Laser Intensity Control According to Video Signal

The 8-bit video signal from the image scanner unit digital processor PCB is input to the laser emission intensity control circuit on the DC controller PCB. Laser intensity output is determined by the laser emission intensity control circuit according to the density level of the video signal.

3. Switching Laser ON/OFF

The laser current switching circuit switches the laser element ON/OFF required for the intensity indicated by the video signal.

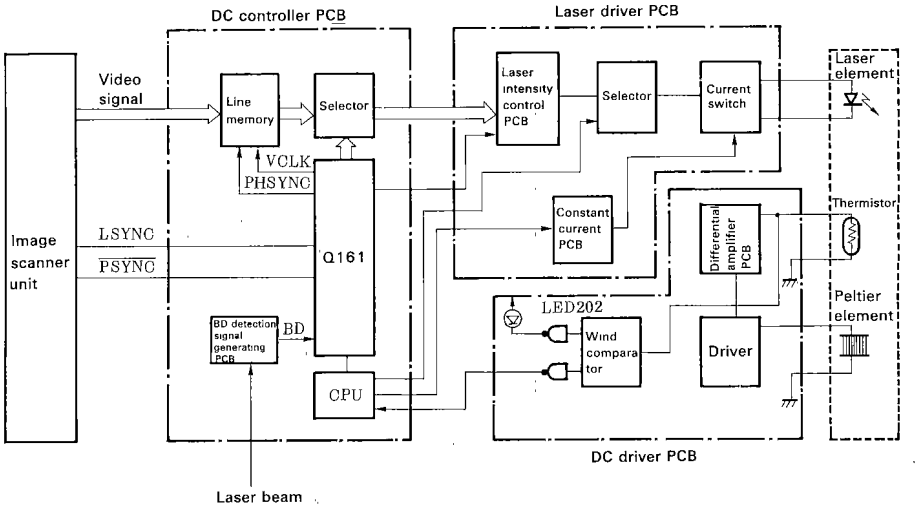

Figure 3-17

4. Laser Unit Temperature Control

This circuit controls the temperature of the laser unit. To stabilize laser beam the intensity of the beam from the laser, the temperature must be maintained constant. The temperature is monitored by a thermistor, and the laser element is heated or cooled by passing current in one direction or the other of the Peltier element.

If the temperature is above the specified value, the current flows from GND to Peltier element and then to driver; as a result, the Peltier element absorbs heat.

If the temperature is below the specified value, on the other hand, the current flows from driver to Peltier element and then to GND; as a result, the Peltier element generates heat.

When the laser reaches the correct temperature LED202 goes ON indicating that the laser is ready to be used.

Note:
Peltier effect
When current flows through the junction of different conductors (or semiconductors), heat is absorbed or generated (other than resistive, depending on the direction of the current).

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C. Scanning Mirror Motor Driver Circuit

The scanning mirror drive motor is a 4-phase, 4-pole DC motor with Hall elements. It turns the 8-facet scanning mirror at constant speed.

When a SCANNER DRIVE command $\overline{\text{SCNON}}$ (0) is received from the operation controller, this circuit is activated to maintain the scanning mirror drive motor speed constant. When the correct speed is reached, signal $\overline{\text{SCNRDY}}$ goes "0".

The scanning mirror drive motor is shown with its control circuit in Figure 3-18. Two Hall devices spaced 135° sense the position of the rotor (permanent magnet type) and switch current through coils A and D or B and C, as required to attract the rotor to the next position.

As the N pole of the rotor approaches a Hall element, its (−) side goes negative, and (+) side goes positive, thus developing an emf. (When the S pole approaches, the EMF will be developed in the opposite direction.) In Figure 3-18, Hall element I is facing an N pole of the rotor, so a is "0". This causes current flow through stator A. As stator A applies a magnetic force to the S pole facing it, the S pole (and consequently, the rotor) is repelled, and stator A attracts the following N pole on the rotor. Thus, the motor turns in the direction of the arrow.

As the motor rotates through approximately 45°, Hall element I stops generating an emf, cutting off current flow in stator A. And the S pole is facing Hall element II, which then generates an emf. Now b goes "0" and current flows in stator B. Its magnetic force repels the N pole and attracts the S pole.

This process is repeated every time the rotor turns through 45°, with c,d, and a going "0" in order; this magnetizes stators C, D, and A in order.

The speed of the rotor is maintained constant by the control circuit using feedback from the frequency generator (F.G.), a Hall IC.

Overcurrent in the stators activates the current limiter, shutting off the current.

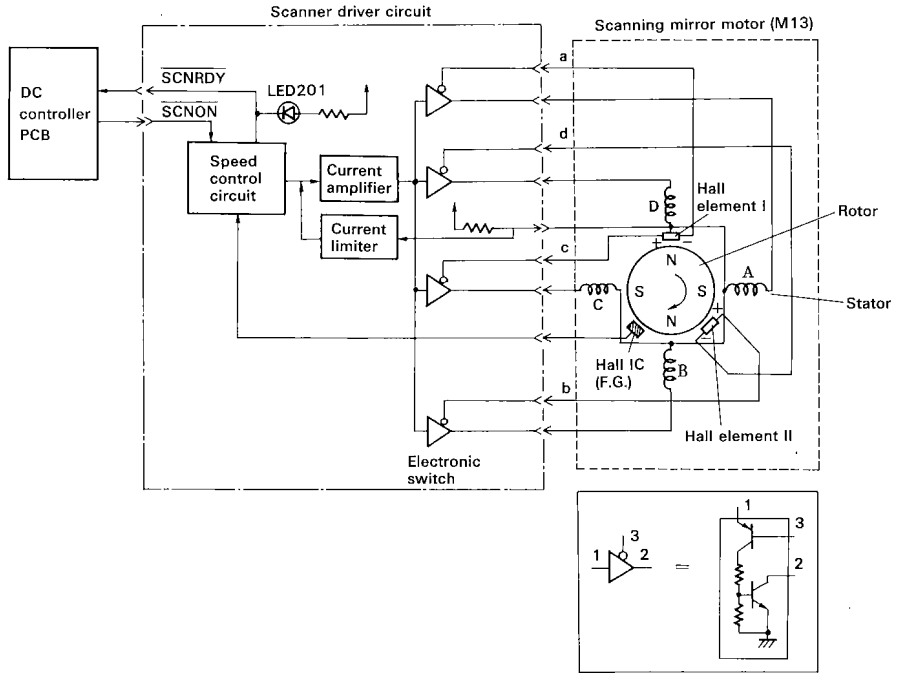

Figure 3-18

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D. Auto Focus Control Circuit

1. Outline

The printer is equipped with an auto focus (AF) mechanism which uses laser beams; the mechanism serves to enable high resolution by moving the lens position so that the diameter of the beam on the photosensitive drum is kept as small as possible at all times.

2. Auto Focus Control

The AF control of the printer moves the correction lens before potential control is performed and locates it at its best position.

The stepping motor (STM4) is used to move the correction lens over several points and a laser beam is generated at each of these points.

The beam is reflected by the BD mirror found along its path and is led to the focus detection PCB of the DC controller PCB.

The focus detection PCB, in turn, sends AF signals suited to the intensity of the beam to the microprocessor of the transfer driver PCB.

The microprocessor of the transfer driver PCB, from among the AF signals sent, chooses the position at which the intensity is highest and moves the correction lens to that position.

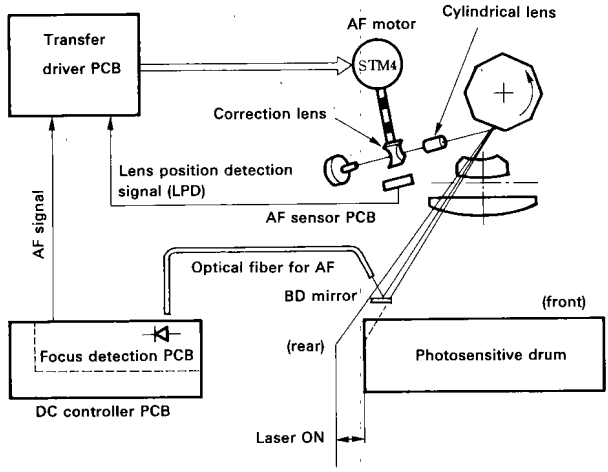

Figure 3-19

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Note:
1. The AF sensor PCB serves to detect the original position of the lens.
2. The printer uses two optical fibers; one is for BD and the other, for AF.

The auto focus control mechanism is activated only when the power switch is turned ON and before the potential control rotation (CNTR).

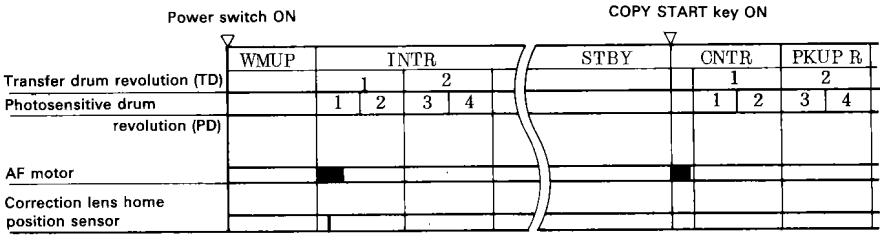

Figure 3-19a

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E. Horizontal/Vertical Synchronization

1. Horizontal Synchronizaiton

A horizontal synchronizaton signal is required to cause the image scanner unit to transfer each element of the video signal to the printer.

The BD signal is generated by the beam detection signal generating circuit on the DC controller PCB when laser light (signal BD) reflected by the BD mirror and conducted by the optical fiber strikes the photocell of the circuit.

Q162 of the DC controller PCB uses the BD signal to generate the HORIZONTAL SYNC signal (LSYNC) and sends it to the image scanner.

In response to LSYNC, the image scanner unit sends one set (element) of video data (VDO-0 to VDO-7) to the printer DC controller PCB where they are stored in the line memory.

These data are sequentially read out in response to the PRINTER HORIZONTAL SYNCHRONIZATION signal (PHSYNC) and used to generate the LASER INTENSITY CONTROL signal. This, in turn, is used to generate the LD drive signal that operates the laser.

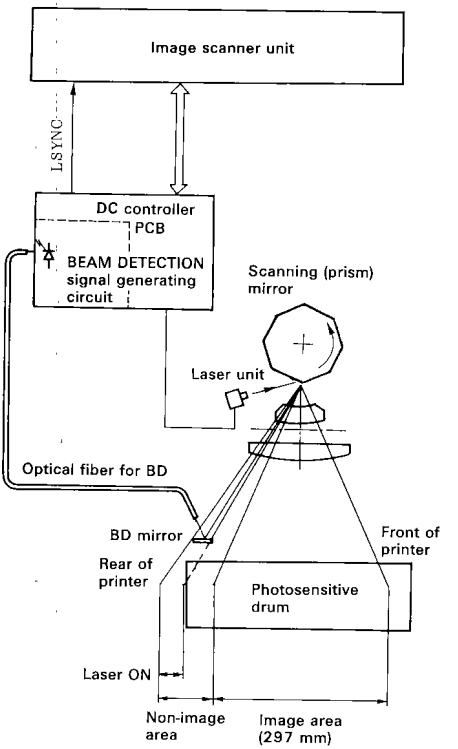

Figure 3-20

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2. Vertical Synchronization

A vertical scanning timing signal is required for the image scanner unit to transfer the video signal to the printer.

In order to ensure that the various color toner images (up to four) are overlaid in accurate registration on the copy, it is necessary to identify the position of the leading edge of the paper on the transfer drum so that scanning by the laser beam (to form the image) can begin at the correct point on the photosensitive drum.

This VERTICAL SCAN TIMING signal is produced by the image leading edge sensor (Q15) inside the transfer drum unit and a signal generating plate on the outer of the drum. The IMAGE LEADING EDGE signal (ILEG) from Q15 goes to the DC controller, which generates the (PSYNC) signal and sends it to the scanner.

The PAGE SYNC signal is not generated for each rotation of the transfer drum. For paper longer than A4/Letter, the signal is generated for every second rotation of the transfer drum in order to provide sufficient time for developing the image for the larger length of the copy paper.

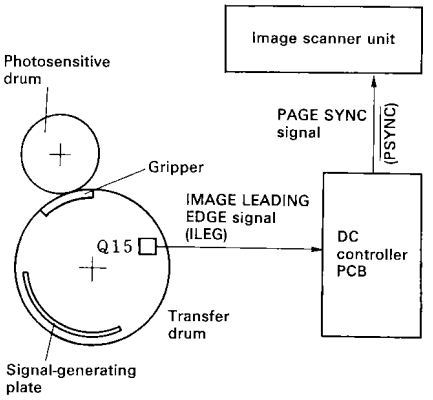

Figure 3-21

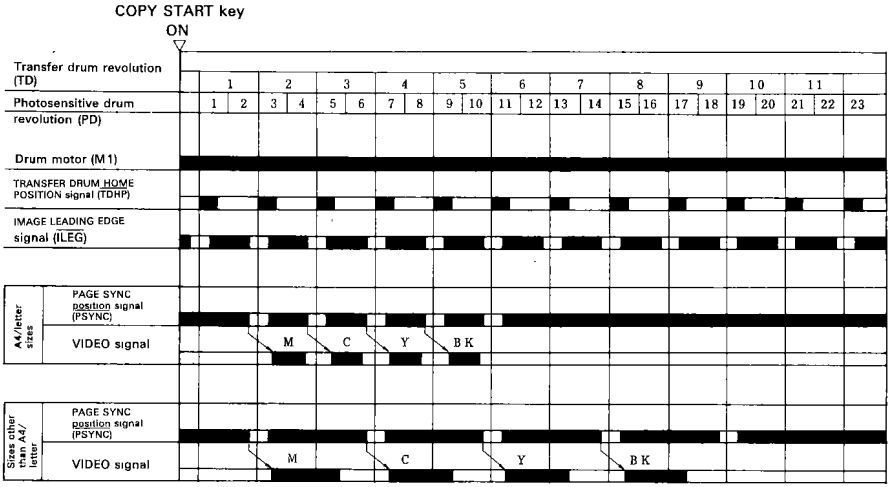

Figure 3-22

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III. IMAGE FORMATION SYSTEM

A. Drum Surface Potential Control System

1. Outline

The main causes of variation in copy image quality are variation in the electrostatic latent image and variation in development.

Two major factors causing variation in static latent image are:

1. Variation in drum sensitivity (VL) due to age and environment
2. Variation in primary corona current to the drum

Development characteristics can vary due to changes in behavior of the toner during development resulting from different combinations of temperature and relative humidity, as well as because of deterioration or wear of mechanical parts and dirt inside the printer.

The function of the drum surface potential control system is to compensate for these problems. It does this by adjusting the bias on the grid of the primary corona unit and the DC component of the bias on the developing cylinder in response to changes in the drum surface potential measured by the surface potential sensor.

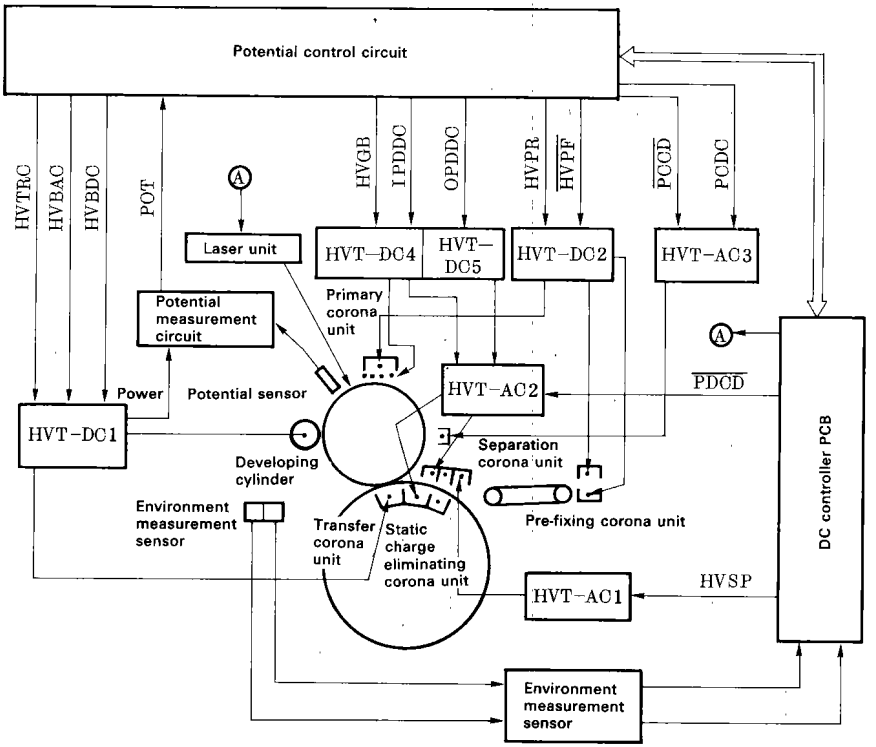

Figure 3-23

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2. Control System

The potential-control system has two functions. It controls the bias on the grid of the primary corona unit, and it controls the bias on the developing cylinder so that the differential between developing cylinder bias and light-area potential (on the drum) is maintained constant. This differential is the contrast potential (developing bias differential).

a. Setting the Target Contrast Potential (target developing bias differential)

A sensor near the developing unit senses the conditions nearby.

The control system then establishes a target contrast potential (target developing bias differential) for developing each color based on the measurements. This is represented by Figure 3-24.

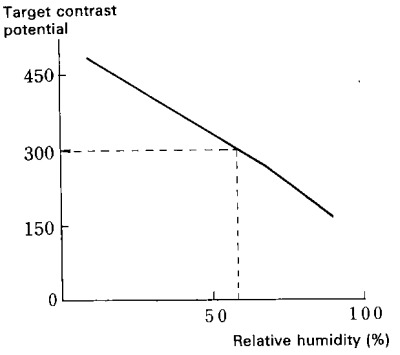

Figure 3-24

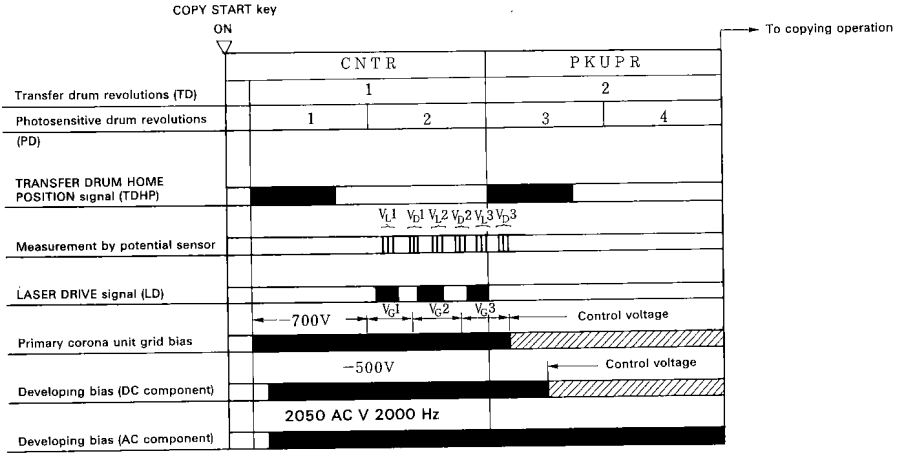

Figure 3-25

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b. Surface Potential Measurement

To determine the characterists of the drum, the surface potential in a dark area (laser OFF; V_D) and in a light area (laser ON; V_L) is measured for a fixed primary corona current using one of two pairs of different primary corona grid bias voltages (V_G).

V_G1	V_G2	V_G3
-300 V	-600 V	-800 V

Table 3-3

Thus, V_D1 and V_L1 are measured with V_G1. V_D2 and V_L2 with V_G2; and V_D3 and V_L3 with V_G3. Straight lines can be drawn through V_D1, V_D2, and V_D3 and through V_L1, V_L2 and V_L3, giving the plot shown in Figure 3-26.

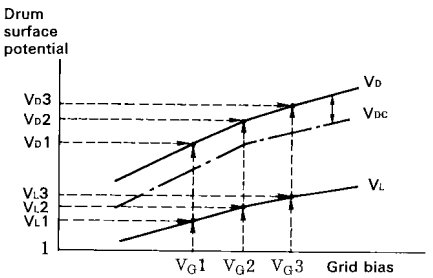

Figure 3-26

Surface potential measurement / Time of copying operation	Number of potential measurements					
	V_G1		V_G2		V_G3	
	V_D	V_L	V_D	V_L	V_D	V_L
First copy after power switched ON	3	3	3	3	3	3
First copy 4 min after previous potential control						
First copy after paper jam cleared						

Table 3-4

c. Setting the Grid Bias and Developing Bias

To eliminate fogging during copy operation, a line for the developing bias (V_{DC}) is drawn at points corresponding to $V_D + 150$ V. The potential (contrast potential) between V_{DC} and V_L shown in Figure 3-27 is used to find the point whose value is the same as the target contrast found in Figure 3-24. The target values of the grid and developing biases are obtained based on this point.

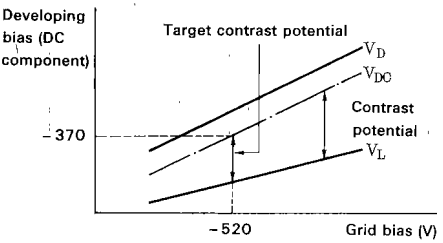

Figure 3-27

Note:
The contrast potential (manual) is set in five steps; each setting (manual) is a fixed potential and cannot be changed in the field. Either of the five settings, however, may be selected in the service mode.

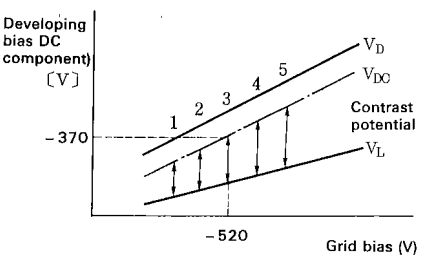

Figure 3-28

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3. Potential Measuring Circuit

Figure 3-29 is a block diagram of the potential measuring circuit.

Charges on the drum (which give the drum its surface potential) induce a voltage in the electrode of the sensor. The vibrating chopper alternately blocks and unblocks the path between the charges and the electrode, so that the voltage induced in the electrode rises from zero to maximum and falls back to zero sinusoidally. (The AC-like waveform has only one polarity. The polarity changes as the surface charge polarity changes.) This voltage is amplified by the pre-amplifier in the sensor housing and then transmitted to the filter/gain-control circuit on the potential measuring PCB.

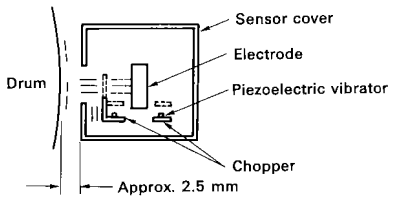

Figure 3-29 Cross-sectional view of the potential sensor

The filter/gain control circuit eliminates electrical noise in the AC signal from the sensor pre-amplifier, amplifies the signal, and transmits it to the cync-clamp circuit through a photo-coupler.

To determine whether the drum potential is higher or lower than the sensor bias voltage, the sync-clamp circuit combines the sensor output (via the filter and gain-control circuits) with the SYNC signal (the timing of which is adjusted by the SYNC signal adjusting circuit).

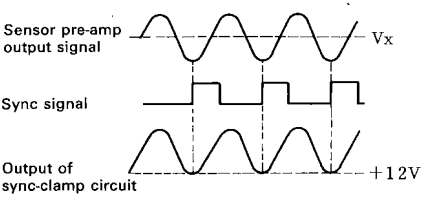

Figure 3-31 Sensor bias is lower than drum potential

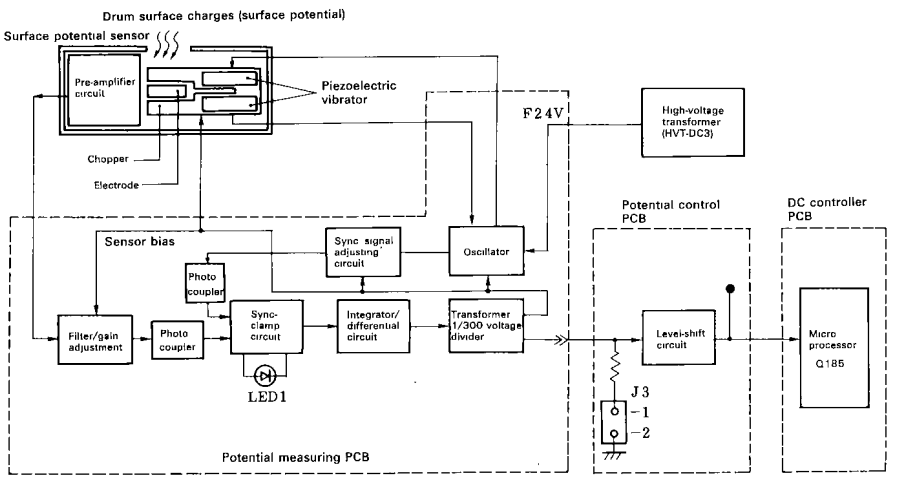

Figure 3-30

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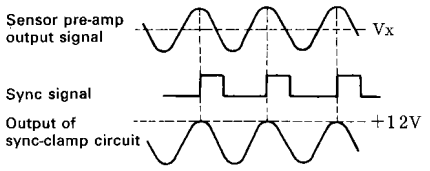

Figure 3-32 Sensor bias is higher than drum potential

The output of the sync-clamp circuit is integrated by the integrator, amplified, and then applied to the transformer. The transformer output, which is varied over the range 0 V to – 600 V by the signal, is applied to the sensor as the sensor bias. It is also reduced to about 1/300 of its original strength by a voltage divider and transmitted to the level-shift circuit of the potential control circuit.

The signal that arrives at the level shift circuit is amplified by a factor of 2, and 0.25 V is added (level shift).

The output signal (analog) from the level shift circuit directly enters the microprocessor of the DC controller PCB.

■ Check method

1 Check LED1 lights

LED1 should be ON whenever the copying machine is switched ON to indicate that the potential sensor measurement system is operating normally.

If it is not ON when the printer is ON, either the F24 V power supply is not supplying power or there is a fault in the potential measurement unit.

2 Check pins

DC controller PCB pins J3-1 and J3-2 are used to determine whether the potential measurement unit is operating normally or not.

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4. Primary/Pre-fixing Corona Current Control Circuit

a. General

Figure 3-33 shows the circuit that controls the primary and pre-fixing corona currents. The main functions are:

- Switching primary and pre-fixing corona currents ON/OFF.
- Maintaining the primary and pre-fixing corona currents constant to eliminate the effects of environment.

b. Operation

1 Primary Corona Control System

- When the PRIMARY CORONA CURRENT CONTROL signal (HVPR) exceeds 8 V, the voltage corresponding to the voltage of HVPR (analog) is output to the primary corona unit.
- When HVPR becomes less than 8 V, the primary corona HV transformer goes OFF in the reverse of the above.
- PRIMARY CORONA CURRENT CONTROL signal (HVPR) output (less than 8 V)
  - Pulse width variable oscillation circuit OFF
    - Primary high-voltage transformer OFF
    - LED1 OFF
- PRIMARY CORONA CURRENT-CONTROL signal (HVPR) output (over 8 V)
  - Pulse width variable oscillation circuit ON
    - Primary high-voltage transformer ON
    - LED1 ON

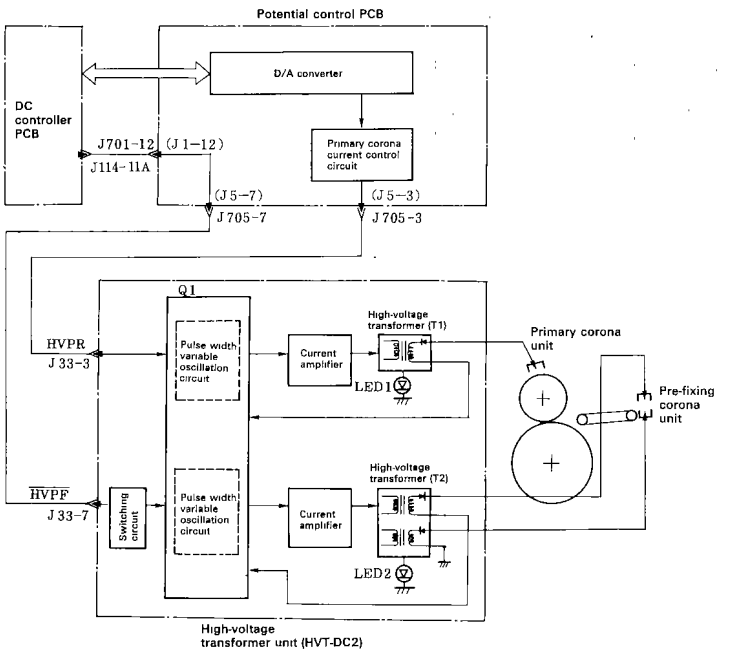

Figure 3-33

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2 Pre-fixing Corona Current Control System

- PRE-FIXING CORONA DRIVE command ($\overline{\text{HVPF}}$) = 0
  - Switching circuit OFF
    - Pulse width variable oscillation circuit ON
      - Pre-fixing corona HV transformer (T2) ON
      - LED2 ON

- PRE-FIXING CORONA DRIVE command ($\overline{\text{HVPF}}$) = 1
  - Switching circuit ON
    - Pulse width variable oscillation circuit OFF
      - Pre-fixing corona HV transformer (T2) OFF
      - LED2 OFF

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5. Primary Corona Unit Grid Bias Control System

a. Outline

The circuit in Figure 3-34 controls the bias voltage of the primary corona unit on the grid, and operates in response to a control signal from the microprocessor of the DC controller from the data obtained while the drum surface potential was being adjusted during CNTR.

The control signal from the DC controller is converted to analog control signal HVGB by the potential control PCB. HVGB controls the output of HVT (T1) by the pulse width variable oscillation circuit.

b. Operation

When the GRID BIAS VOLTAGE CONTROL signal (HVGB) is below 16 V, the grid bias voltage is proportional to the voltage of HVGB (analog).

If HVGB goes above 16 V the grid bias goes OFF.

- GRID VIAS VOLTAGE CONTROL signal (HVGB) less than 16 V
  - → Pulse width variable oscillation circuit ON
    - → Grid bias HV transformer ON
- GRID BIAS VOLTAGE CONTROL signal (HVGB) over 16 V
  - → Pulse width variable oscillation circuit OFF
    - → Grid bias HV transformer OFF

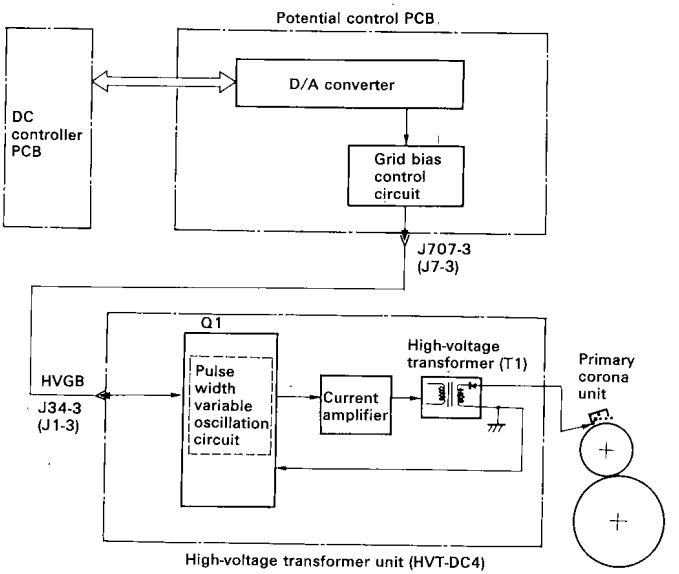

Figure 3-34

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6. Developing Bias Control Circuit

Figure 3-35 shows the circuit that controls the developing bias.

a. Functions

- Turns the AC component of the developing bias ON and OFF.
- Controls the voltage level of the AC component of the developing bias.
- Turns the DC component of the developing bias ON and OFF.
- Controls the voltage level of the DC component of the developing bias.

b. Turning the AC Bias ON and OFF

When the AC level control signal (HVBAC) of the developing bias is 8 V or more, an AC bias is applied to the developing cylinder. When HVBAC is 8 V or less, no AC bias is applied to the developing cylinder.

- Developing bias AC drive signal (HVBAC) output is 8 V or less
  - Amplitude control circuit OFF
    - T1 drive circuit OFF

No AC bias is applied to the developing cylinder.

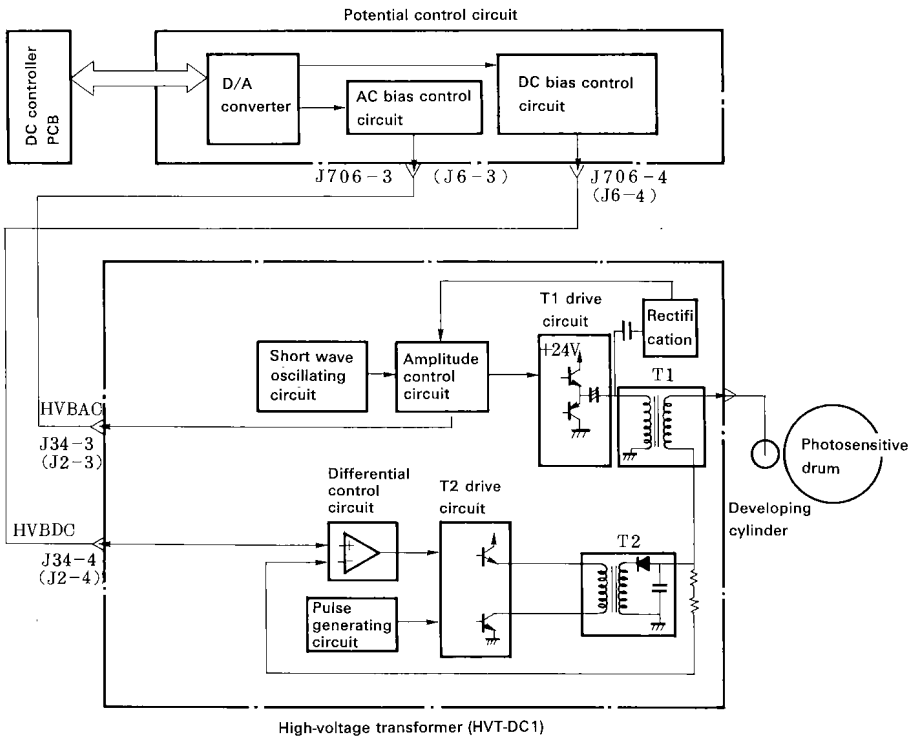

Figure 3-35

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- Developing bias AC drive signal (HVBAC) output is 8 V or more
  - Amplitude control circuit ON
    - T1 drive circuit ON

An AC bias is applied to the developing cylinder according to the HVBAC signal.

2 Turning the DC Bias ON and OFF

When the developing bias DC level control signal (HVBDC) is 16 V or more, no DC bias is applied to the developing cylinder. When the HVBDC is 16 V or less, a DC bias is applied to the developing cylinder.

- Developing bias DC level control signal (HVBDC) output is 16 V or more
  - Differential amplifier circuit OFF
    - T2 drive circuit OFF
- Developing bias DC level control signal (HVBDC) output is 16 V or less
  - Differential amplifier circuit ON
    - T2 drive circuit ON

A DC bias corresponding to HVBDC is applied to the developing cylinder.

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B. Transfer Corona Current Control System

1. Outline

Figure 3-36 shows the transfer corona control circuit. The main functions are:

- Switching transfer corona current ON/OFF
- Switching transfer corona current

There are up to four transfers of toner onto a sheet of copy paper, one for each of the colors of toners. For each successive transfer the transfer corona current increases to increase the attraction of toner to the paper and thus ensure satisfactory transfer.

2. Transfer Corona Current Control

The TRANSFER CORONA DRIVE command ($\overline{\text{HVTR}}$) is always 0, so the analog TRANSFER CORONA CURRENT CONTROL signal (HVTRC) switches the transfer corona high-voltage transformer ON/OFF as well as determining the corona current.

- HVTRC signal output less than 16 V
  - Pulse width variable oscillation circuit ON
    - Transfer HV transformer ON
      - LED1 ON
- HVTRC signal output over 16 V
  - Pulse width variable oscillation circuit OFF
    - Transfer HV transformer OFF
      - LED1 OFF

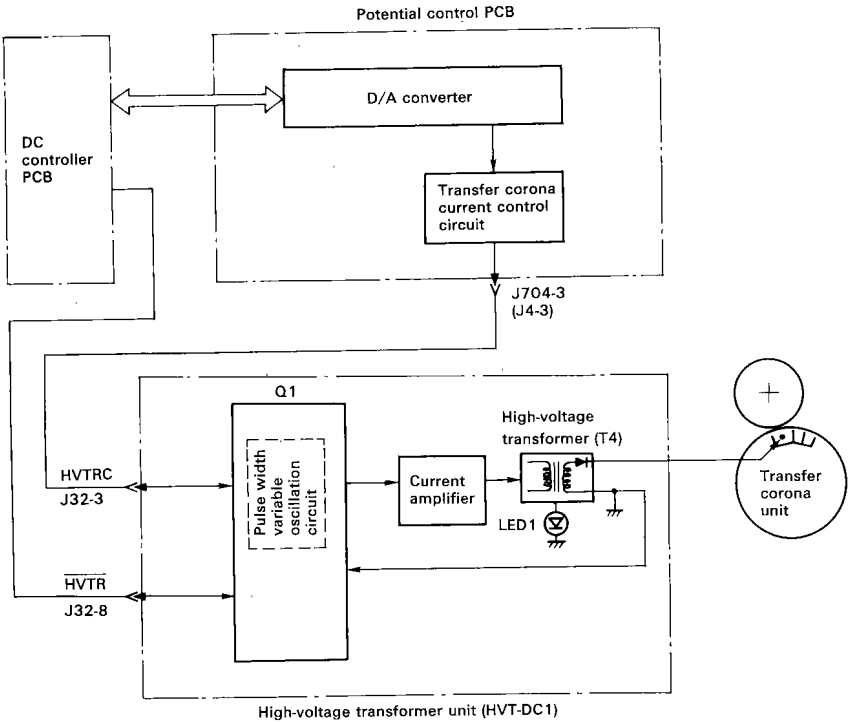

Figure 3-36

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C. Static Charge Eliminating Corona Current Control System

1. Outline

Figure 3-37 shows the static charge eliminating (SCE) corona control circuit. The main functions are:

- Static charge eliminating corona (internal and external) AC component ON/OFF
- Switching static charge eliminating corona (internal) DC component ON/OFF and controlling its voltage

2. Operation

a. Switching External and Internal SCE Corona AC Component ON/OFF

- STATIC CHARGE ELIMINATING CORONA DRIVE command ($\overline{PDCD}$) = 1
  - Switching circuit OFF
    - Pulse oscillator OFF
      - SCE corona HV transformer OFF
- STATIC CHARGE ELIMINATING CORONA DRIVE command ($\overline{PDCD}$) = 0
  - Switching circuit ON
    - Pulse oscillator ON
      - SCE corona HV transformer ON

b. Switching Internal SCE Corona DC Bias ON/OFF and Controlling Voltage

- SCE (INTERNAL) CORONA DC VOLTAGE CONTROL signal (IPDDC, OPDDC) output
  - Pulse width variable oscillation circuit OFF
    - Drive circuit OFF

If the SCE CORONA DC VOLTAGE CONTROL signal is less than 8 V, no DC voltage is supplied.

- SCE (INTERNAL) CORONA DC VOLTAGE CONTROL signal (IPDDC, OPDDC) output over 8 V
  - Pulse width variable oscillation circuit ON
    - Drive circuit ON

DC bias applied to SCE corona unit with voltage proportional to analog signal PDDC.

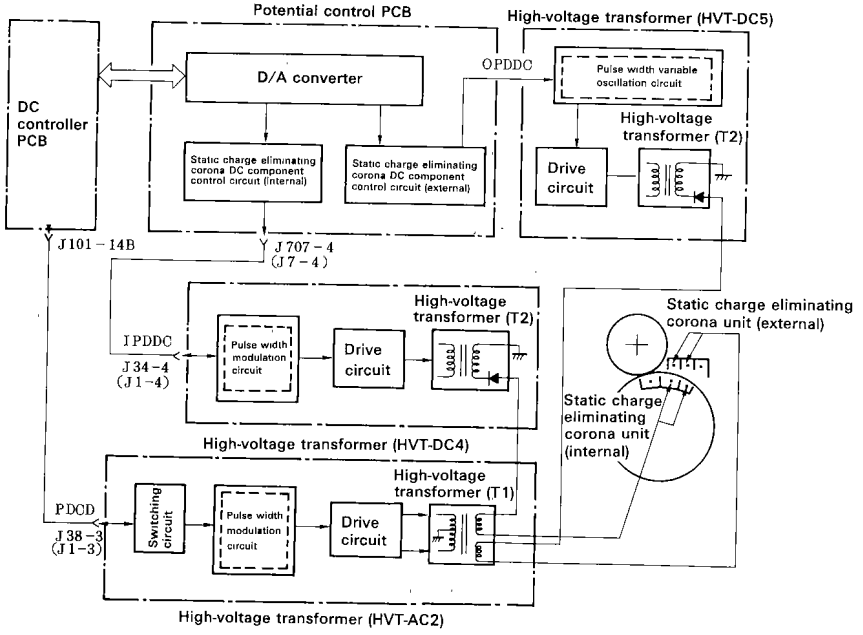

Figure 3-37

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D. Separation Corona Current Control System

1. General

The circuit shown in Figure 3-38 switches the separation corona current ON/OFF.

2. Operation

- SEPARATION CORONA DRIVE command ($\overline{\text{HVSP}}$) = 1
  - Switching circuit OFF
    - Pulse width variable oscillation circuit OFF
      - High-voltage transformer OFF

- SEPARATION CORONA DRIVE command ($\overline{\text{HVSP}}$) = 0
  - Switching circuit ON
    - Pulse width variable oscillation circuit ON
      - High-voltage transformer ON

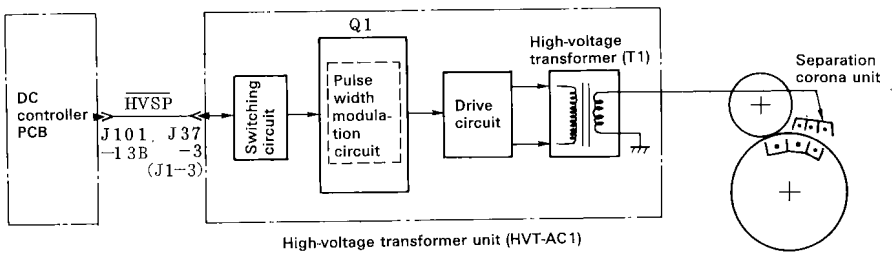

Figure 3-38

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E. Pre-Cleaning Corona Current Control System

1. Outline

Figure 3-39 shows the circuit that controls the pre-cleaning corona current and has the following functions:

1 Turns the AC component of the pre-cleaning current ON and OFF
2 Controls the voltage level of the DC component of the pre-cleaning current

2. Operation

a. Pre-cleaning drive signal ($\overline{PCCD}$) is "1"
- Switch circuit OFF
  - Pulse generating circuit OFF
    - High-voltage transformer OFF

- Pre-cleaning drive signal ($\overline{PCCD}$) is "0"
  - Switch circuit ON
    - Pulse generating circuit ON
      - High-voltage transformer ON

b. Controlling the Voltage Level of the DC Component of the Pre-cleaning Current

When the pre-cleaning DC level control signal (PCDC) is 8 V or less, no DC bias is applied. If it is 8 V or more, a high voltage corresponding to the voltage level is output.

- Pre-cleaning drive signal ($\overline{PCCD}$) is 8 V or less
  - Pulse generation circuit OFF
    - Drive circuit OFF
      - High-voltage transformer OFF
- Pre-cleaning drive signal ($\overline{PCCD}$) is 8 V or more
  - Pulse generating circuit ON
    - Drive circuit ON
      - High-voltage transformer ON

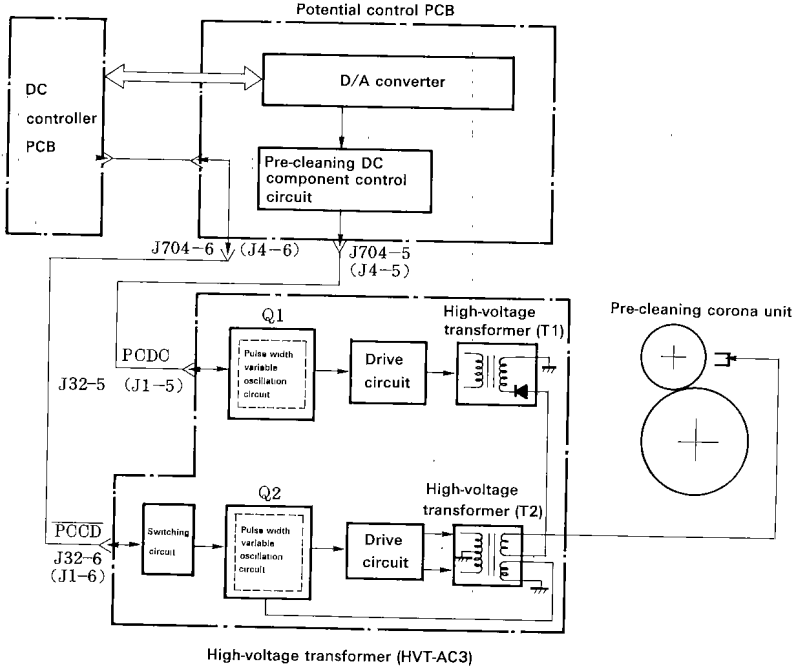

Figure 3-39

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F. Drum Temperature Control System

1. Outline

The sensitivity of the photosensitive drum varies with temperature and humidity.

A 50W heater inside the drum shaft heats the drum to overcome undesirable effects.

2. Control System

Whenever the printer is plugged in, power is supplied to the drum heater control circuit whether the power switch is ON or OFF. The temperature near the drum is sensed continuously by the thermistor of the drum heater control circuit, located near the drum. If the ambient temperature near the drum is low, power is supplied to the drum heater via SSR Q307.

The temperature of the drum surface is controlled at 37°C.

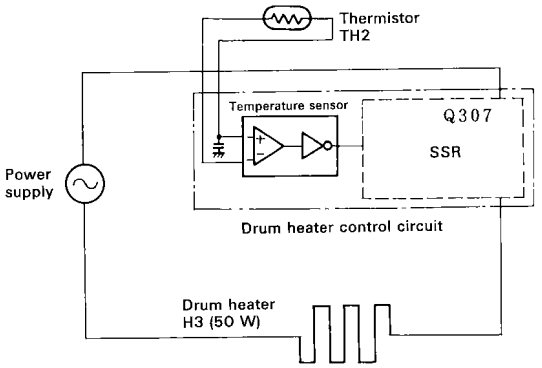

Figure 3-40

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G. Developing Unit /Drum Cleaning Unit

1. General

The four color developing units are mounted ferris-wheel style in a turret unit. Each developing unit is rotated (by motor M4) in turn into position facing the photosensitive drum.

The developing cylinder in position against the photosensitive drum is rotated by the developing cylinder drive motor M3.

The concentration of toner in the developer on the developing cylinder in position is determined by the toner concentration sensing circuit. If the concentration is low, the feedscrew that feeds toner to that unit is engaged (motor M2 driving via clutches CL5, 6, 7, 8) to feed toner from the hopper.

The quantity of toner in the hoppers is sensed by toner sensors. If any is too low, the TONER OUT indicator on the control panel goes ON.

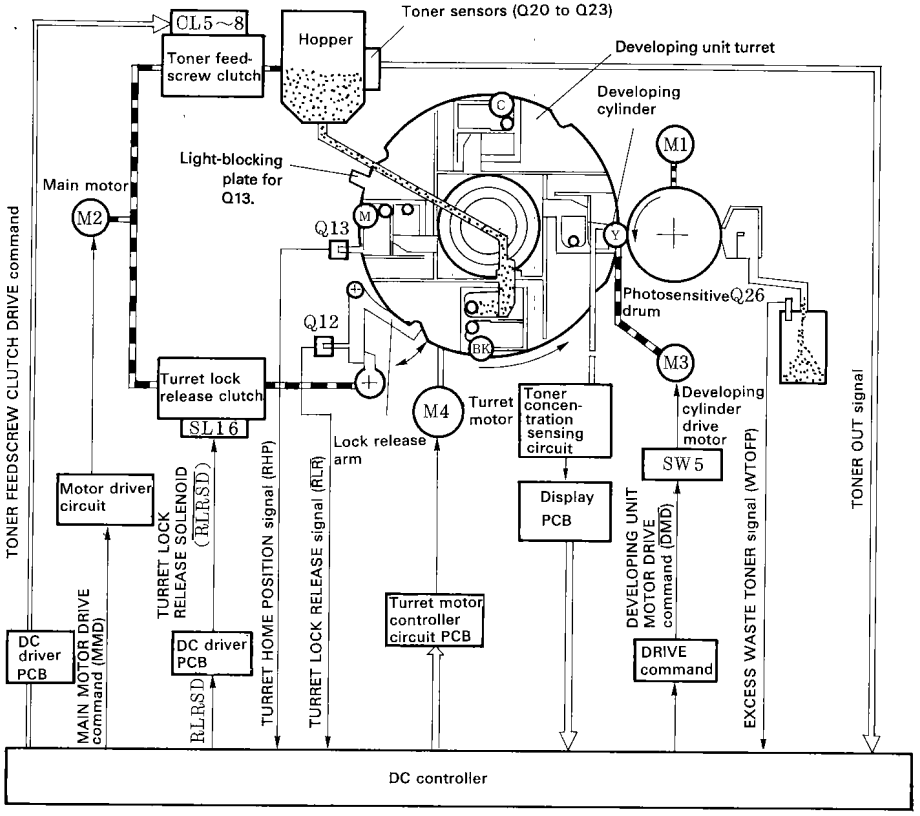

Figure 3-41

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2. Turret Motor Control

a. Outline

Figure 3-42 shows the circuit that controls the turret motor (M4) and has the following functions:

1 Turns the turret motor ON and OFF.
2 Controls the rotation angle of the turret.

The turret motor is a DC motor with a built-in clock pulse generator.

b. Controlling the Rotation of the Turret Motor

The DC controller PCB sends the turret angle signals (RMRAC 1, 2, 3) used to set the developing assembly selected at the developing position. These signals (RMRAC 1, 2, 3) decide at what angle the turret is to be rotated (45°, 90°, 180°, 360°), and the turret motor controller PCB controls the rotation and stop position of the turret according to the signals. When the DC controller PCB sends the turret rotation angle signal and turret motor driver signal (RMD), the microprocessor on the turret motor controller PCB starts the turret motor. When the turret motor rotates, it generates clock pulses which are sent to the microprocessor on the turret controller PCB. The microprocessor, based on these clock pulses, checks the rotation angle of the turret and controls the turret motor.

c. Stopping the Turret Motor

When the turret rotates and comes to a point 30° in front of the stop position, the turret controller PCB sends the turret stop warning signal (PEND). The DC controller PCB, based on the PEND signal, turns the turret lock release solenoid (SL16) OFF. At the same time, it sends the turret motor drive signal ($\overline{RMD}$, "0") to brake the turret motor. When the developing assembly comes to the position selected, the turret lock arm falls in the slot of the turret and the turret lock release signal ($\overline{RLR}$) goes "1". This condition causes the DC controller PCB to send the turret motor signal ($\overline{RMS}$, "0") to stop the turret motor. At the same time, it sends the turret motor control end signal (END) to complete the operation.

Notes:
1. Turret Home Position Drive signal (S. RESET) The signal is used to rotate the turret to return it to the home position if the turret is not at the home position when the power is turned ON.
2. Developing Motor Drive Prohibit signal (ANGL) The signal is used to prohibit the drive of the developing motor while the turret is rotating.

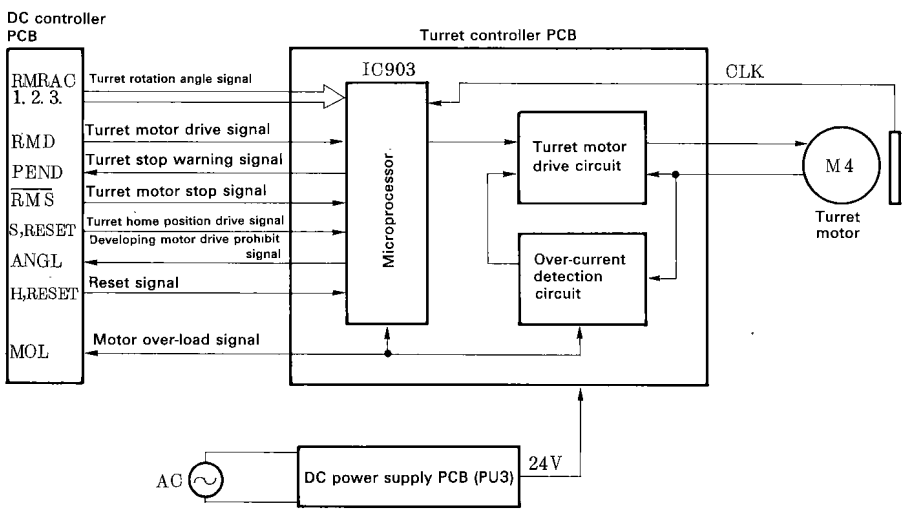

Figure 3-42

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d. Detecting Problems in the Turret Motor

If an excessive load is imposed on the turret motor for some reason, an over-current flows through the drive circuit. When the over-current detection circuit detects the over-current, the drive circuit is forced OFF. At the same time, the motor over-load signal (MOL, "1") is sent to the DC controller PCB to stop the turret motor and indicate "E021" on the control panel.

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3. Toner Concentration Sensing Circuit

a. Outline

The concentration of toner in the developer on the developing cylinder is sensed by a system of a lamp and a photodiode that responds to both blue and infrared light and optical filters. The lamp shines on the developer and the reflected light passes first through a blue, then an infrared, filter. Both toner and iron reflect blue light, so this provides a reference value which is stored in memory. Iron powder absorts infrared, so the amount of radiation passing the IR (seemingly black) filter gives a measure of toner concentration when compared with the reference value.

If the concentration is low, the circuit sends the appropriate TONER SUPPLY command (YTSC, MTSC, CTSC, or BKTSC), and toner is fed from the hopper unit of the required color.

There is only one toner concentration sensing system. It senses the concentration only of toner in the developer in the developing unit then in position for operation.

Light is lead to the developing cylinder while the developing cylinder opposite the photosensitive drum is rotating. The diode senses light through the black filter (infrared) and through the blue film (visible) and converts it to electrical signals.

These two electrical signals are sent to the DC controller PCB by way of developer concentration setting PCB. The DC controller in turn compares these signals against the standard value and, if the concentration is low, actuates the toner supply clutch.

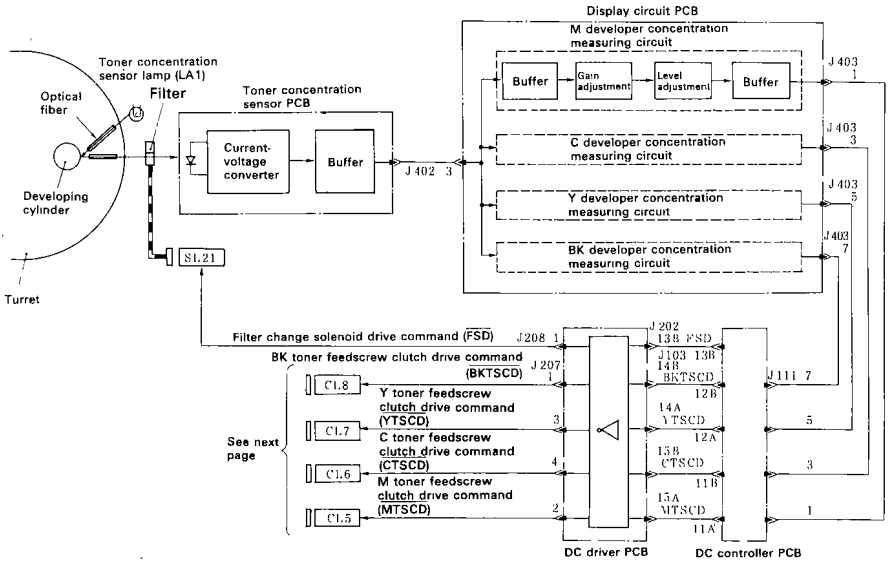

Figure 3-43

Reference

The toner sensors of the hopper units are piezoelectric oscillators. When there is no toner touching one, it oscillates at a frequency of several KHz and the sensor output is LOW. If there is toner in contact, its pressure prevents oscillation, and sensor output is HIGH.

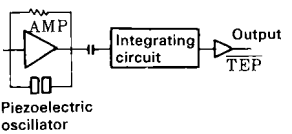

Figure 3-44

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4. Toner Supply Sequence and Turret

The level of the toner is monitored in reference to the level of the developer on the developing cylinder driven by the developing motor (M3). When the DC controller PCB, based on the measurement signal, decides that the level is too low, it initiates the toner supply operation.

The printer, however, is designed so that the toner is not sent to the developing assembly in operation with the developing cylinder in rotation but is sent to the developing assembly under the developing turret.

As shown in Figure 3-46, for example, when yellow development takes place using the Y developing assembly, the level of the yellow toner is checked and, if a supply is called for, the data is stored in memory on the DC controller PCB.

When the C developing assembly is selected next time, the turret rotates, and the C developing assembly is set opposite the photosensitive drum.

While the level of the cyan toner is checked with the C developing assembly in use, yellow toner is sent. In other words, the supply operation for yellow toner is performed while cyan development is taking place since it was found that a supply was called for when the previous yellow development and yellow toner level were checked.

As such, a supply of cyan toner has to wait until magenta development takes place.

Figures 3-47 and -48 show the toner supply sequence. The toner supply clutch shown operates based on the toner supply data obtained during previous copy operation.

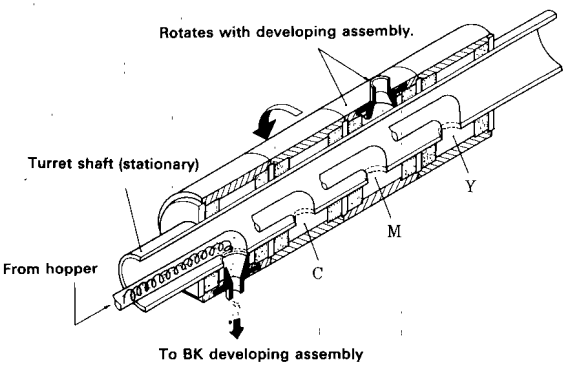

Figure 3-45

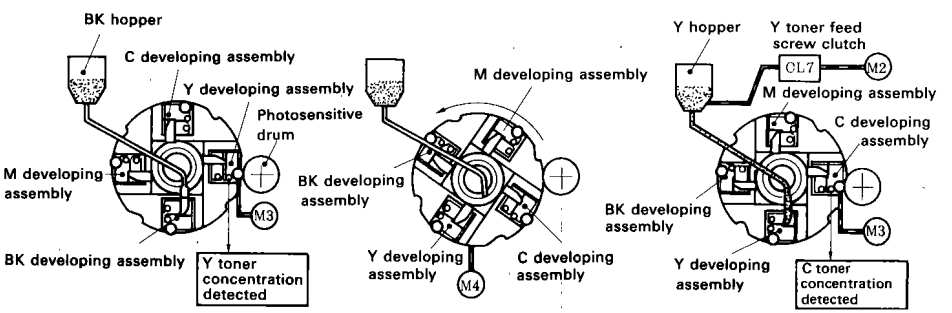

Figure 3-46

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The turret, when copy operation is complete, returns to the home position to prepare for the next operation.

This toner supply operation will not take place for A4R copies (M+Y) and three-color copies (M+C+Y) made in succession. To eliminate effects on the copy quality, however, a toner supply rotation for a single rotation of the transfer drum will be made for each seven copies; this arrangement has been made to increase the speed of copy operation.

Copy mode	Toner not supplied
R copy	M toner
3-color copy	M toner

Table 3-5

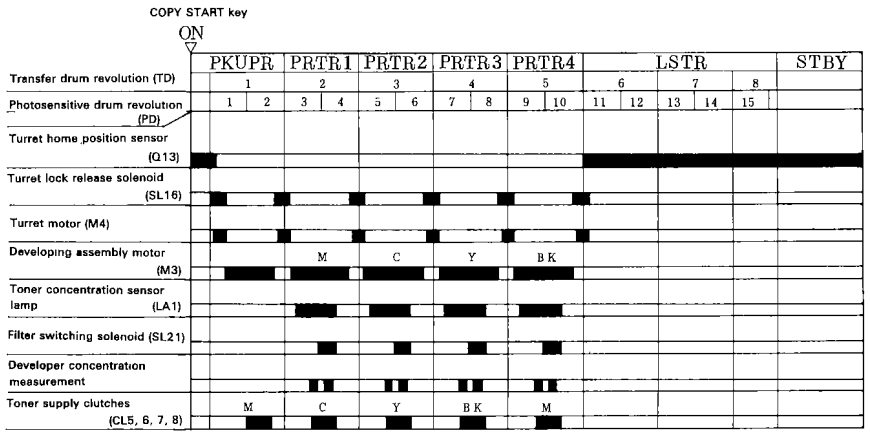

Figure 3-47

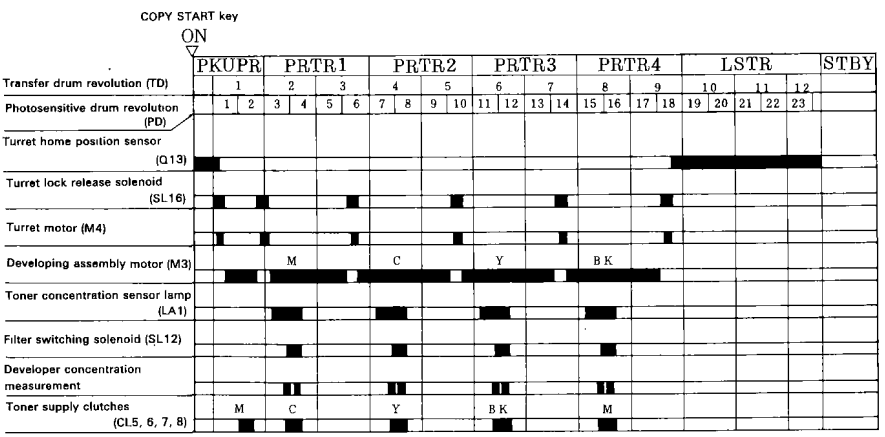

Figure 3-48

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5. Developing Unit Drive Motor Control System

a. Operation

The developing cylinder of each developing unit is operated by the developing unit drive motor (M3) when the developing unit is in operating position.

The developing unit motor is switched ON/OFF by the DEVELOPING UNIT MOTOR DRIVE command (DMD) from the DC controller.

b. Removing Developer

If the developer in a developing unit must be changed (due to contamination, etc.), the operation can be performed virtually automatically. The developing assembly to be emptied is first positioned in the bottom location, then SW5 is switched ON manually.

This causes the developing cylinder at the bottom position to rotate, and feed the developer out of the developing unit where it is attracted to the internal magnet of the magnet roller (which is rotating).

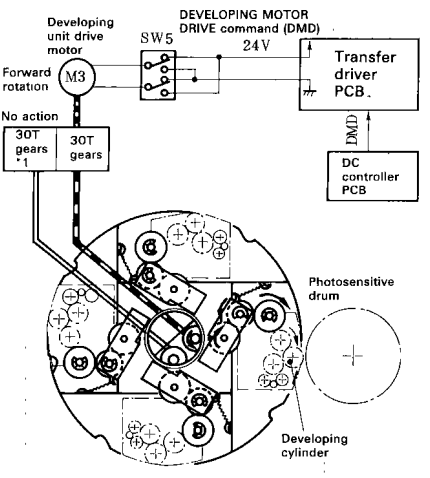

Figure 3-49 During copying

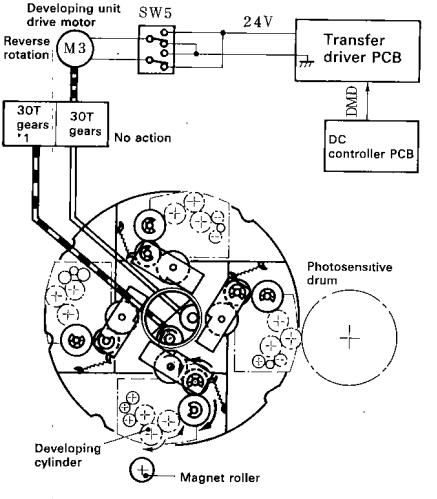

Figure 3-50 Removing waste developer

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c. Developing Motor Control Circuit

Figure 3-51 shows the circuit that controls the developing motor and has the following functions:

1 Turns the developing motor ON and OFF.
2 Controls the rotation speed of the developing motor.

The developing motor is a DC motor with a built-in pulse generator. When the motor rotates, clock pulses (DMCLK) corresponding to the revolution of the motor are generated. The speed control circuit controls the speed of motor rotation based on these pulses.

When the developing motor drive signal (DMD) goes '0', the speed control circuit goes ON, and the developing motor rotates.

The speed control circuit on the transfer driver PCB compares the reference signal inside the circuit and the clock pulses (DMCLK) from the developing motor and sends control signals to the drive circuit so that the two signals are always identical.

The motor drive circuit does not vary the voltage applied to the motor but, instead, varies the ON and OFF periods by turning the supply power to the motor ON and OFF at differing intervals to control the rotation speed; the voltage is held constant.

LED501 remains ON when the rotation speed of the developing motor is as specified.

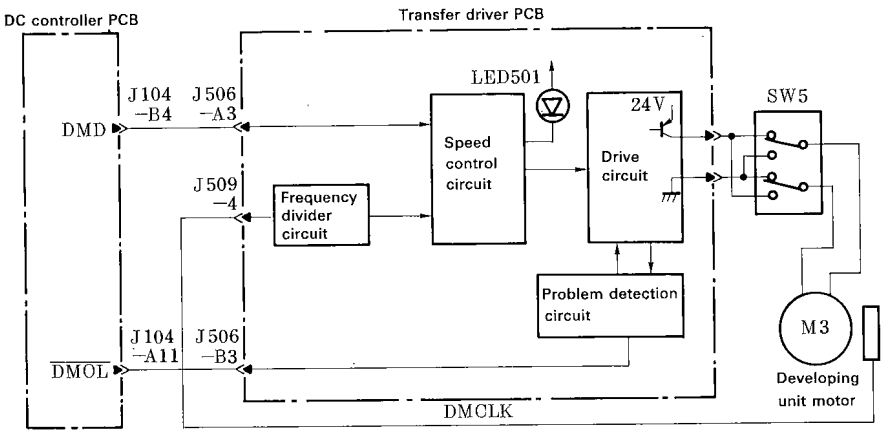

Figure 3-51

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H. Primary Corona Wire Cleaning System

1. General

The cleaning unit automatically cleans the primary corona wire. It operates:

1. Every time the main switch is set ON provided that the temperature of the fixing assembly is under 80°C.
2. When the printer is set to the service mode and a command is issued to clean the primary corona wire.

2. Primary Corona Wire Cleaning

The primary corona wire cleaning unit drive motor (M12) runs in the forward direction for about 25 sec to driving the cleaner forward, reverses for about 25 sec to return the cleaning unit, then stops.

Reference

M12 runs forward when $\overline{CLMD}$ = 0 and CLMF = 0.
M12 runs in reverse when $\overline{CLMD}$ = 0 and CLMF = 1.

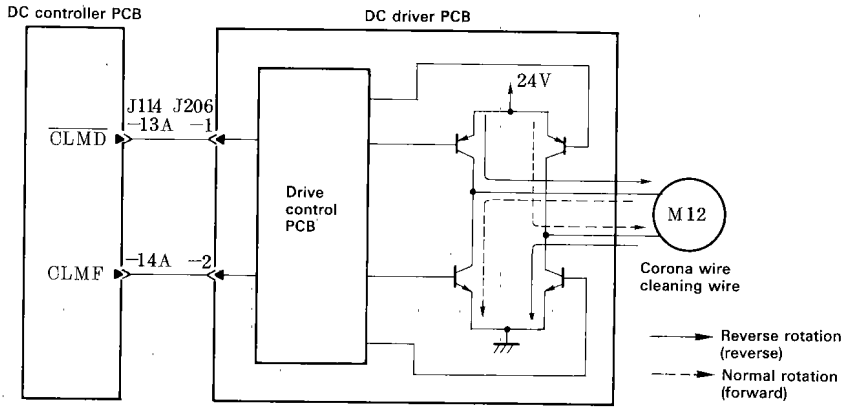

Figure 3-52

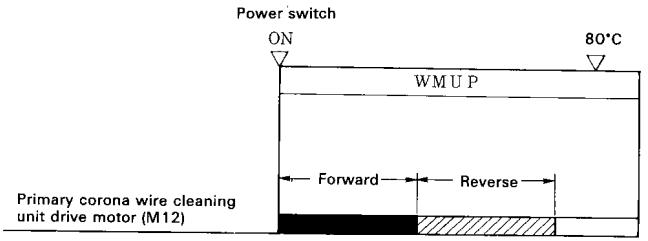

Figure 3-53

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IV. PAPER PICK-UP AND FEED SYSTEM

A. Outline

When pick-up roller clutch CL3 or CL4 is actuated, the pick-up roller rotates and advances one sheet of copy paper from a cassette into the printer.

The sheet is advanced by the feed rollers to the registration rollers, which are stationary at that time.

The registration rollers begin to turn at the time that will feed the paper to the transfer drum so that the leading edge of the paper contacts the grippers of the drum.

The grippers then close and hold the paper to the drum through the various transfer operations (up to four).

When all toner has been transferred to the paper the grippers open and the copy paper is separated from the drum by the separation claw.

The copy paper is then transported to the fixing assembly by the feeder belt and finally delivered to the copy tray.

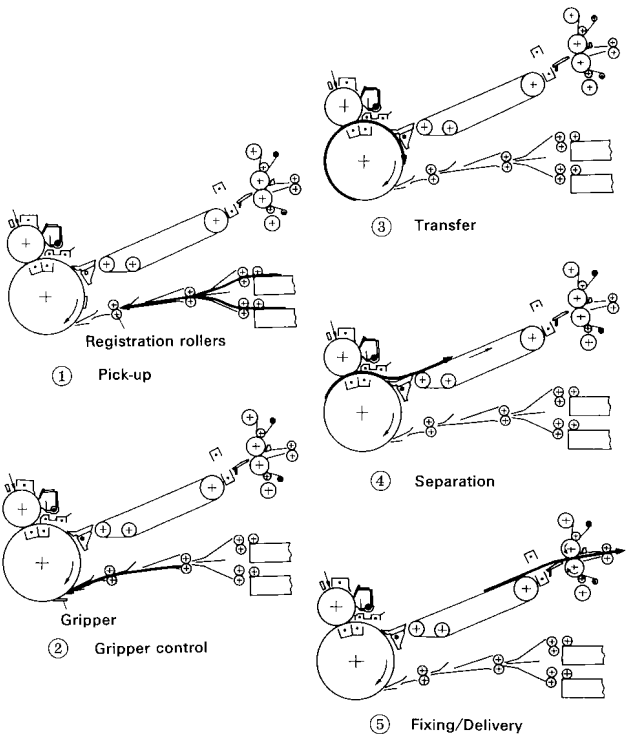

Figure 3-54

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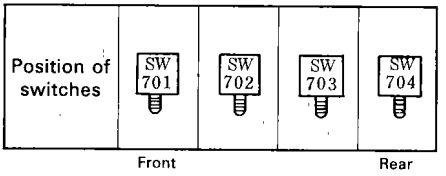
B. Sensing Cassette Size

The control system identifies the persence/size of a cassette by the combination of switches actuated as shown in Table 3-6 by cams on the cassette.



	Cassette size	Switch			
		SW701	SW702	SW703	SW704
1	A4	OFF	OFF	ON	ON
2	B5R	OFF	ON	OFF	OFF
3	B4	OFF	ON	OFF	ON
4	A4R	OFF	ON	ON	OFF
5	A3	OFF	ON	ON	ON
6	Letter	ON	OFF	ON	ON
7	Legal	ON	ON	OFF	ON
8	Letter R	ON	ON	ON	OFF
9	Ledger	ON	ON	ON	ON
10	Cassette not present	OFF	OFF	OFF	OFF

Table 3-6

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C. Pick-up from a Cassette

When the COPY START key is pressed, paper sensors Q8 and Q9 indicate if the lifters are at the lowered position. If so, lifter cam clutches CL1 and CL2 go ON and the cams raise the lifters until the paper is detected by stack height sensors Q6 and Q7.

If there is no signal from Q6 or Q7, the DC controller recognizes that there is no paper in the cassette and sends a PAPER OUT message, which is displayed on the control panel.

If there is paper in the cassette, pick-up roller clutch, CL3 or CL4 goes ON and paper is fed. 0.35 seconds later, the pick-up roller release solenoid SL1 or SL2 goes ON and lifts the pick-up roller off the paper in the cassette.

Copy paper is drawn fully into the printer by the feed rollers and advanced to the registration rollers.

As paper is withdrawn from the cassette, the height decreases until the PAPER SENSOR signal becomes zero. The lifter cam clutch for that cassette then goes ON and the cam raises the lifter. 0.1 seconds after the paper is detected, the clutch goes OFF.

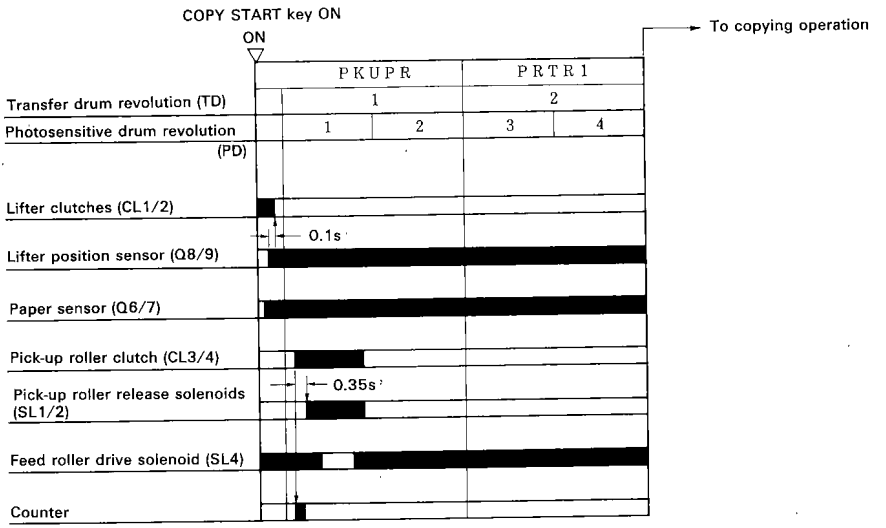

Figure 3-55

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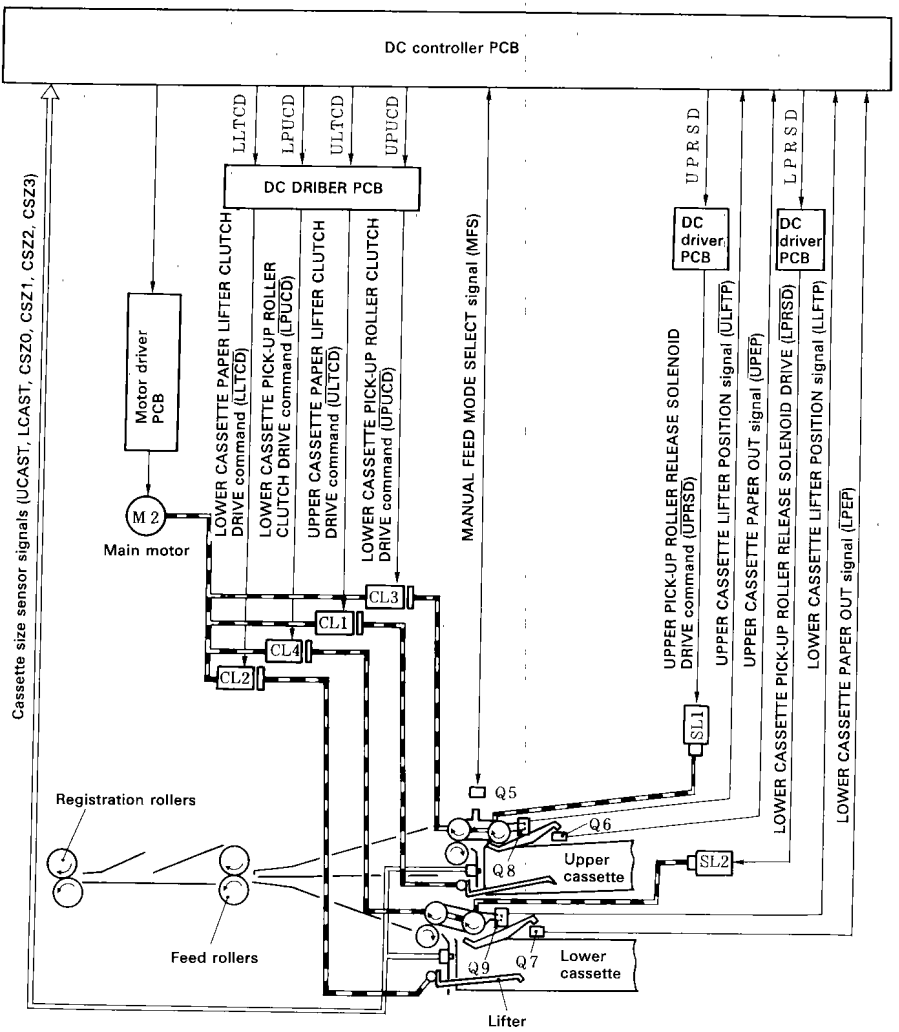

Figure 3-56

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D. Manual Paper Feed

When the manual feed lever is pushed down, a MANUAL PAPER FEED signal (MFS) is input to the DC controller PCB.

When a sheet of copy paper is placed on the manual feed tray and the COPY START key is pressed, the upper cassette pick-up roller release solenoid (SL1) goes ON and raises the pick-up guide plate.

The copy paper is then drawn into printer by the pick-up rollers to the feed rollers.

At this point, the OHP film sensor system (Q19) and lamp determines whether the copy paper is an OHP sheet or copy paper and the speed of the feeder and fixing unit set accordingly. Speed is reduced for OHP film.

If the size of copy paper has not been selected, the length is also determined by the OHP film sensor to set the length scanned in the vertical scan direction.

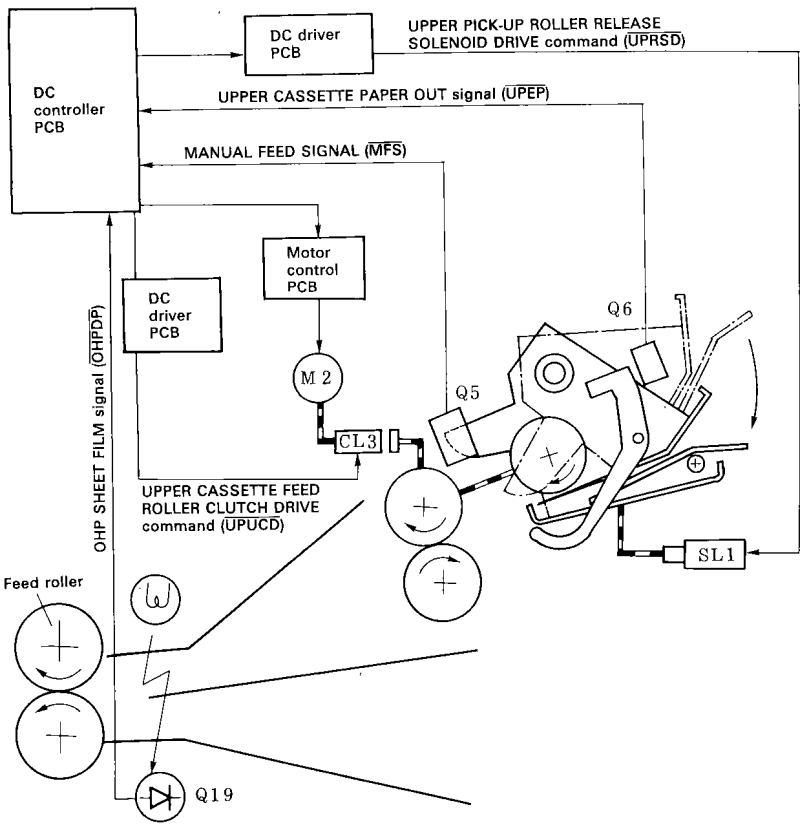

Figure 3-57

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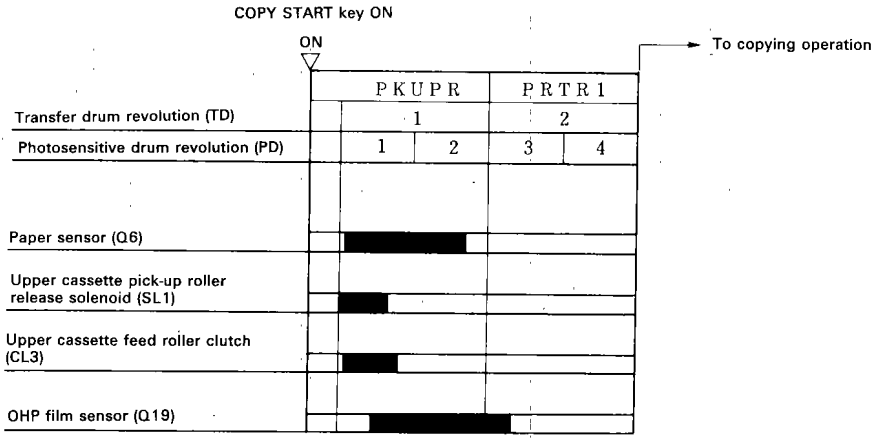

Figure 3-58

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E. Transfer Drum Control

1. Outline

The transfer drum is constructed as shown in Figure 3-59 and serves to catch the copy paper with its grip and feed it to the fixing assembly; up to four transfer operations.

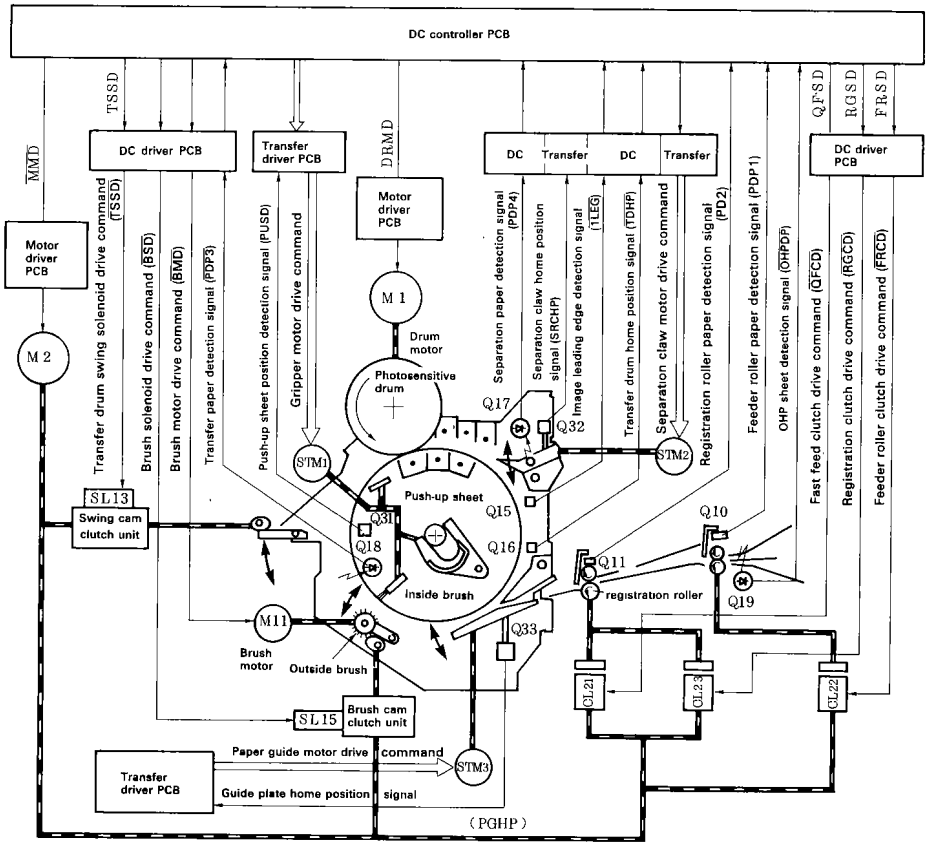

Figure 3-59

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2. Registration Control

The copy paper picked up from the cassette is sent to the registration roller by the work of the feeder roller. The registration roller, in turn, stops the paper so that the paper is aligned with the gripper on the transfer drum; at this time the paper forms an arc.

The gripper on the transfer drum serves to hold the leading edge of the paper and is opened and closed by the work of the gripper cam; to put the paper around the transfer drum, the gripper cam opens the gripper and the transfer drum is rotated.

The registration roller starts to rotate to align the gripper and the leading edge of the paper.

The fast feeder clutch (CL21) is turned ON while the registration roller moves the paper; then the speed of the registration roller is doubled, while the paper is on the move, so that the paper is butted against the gripper.

The operation is repeated and, when the leading edge of the paper comes into contact with the gripper, the gripper closes to hold the paper. In this condition, the paper is put around the transfer drum and sent to the transfer unit.

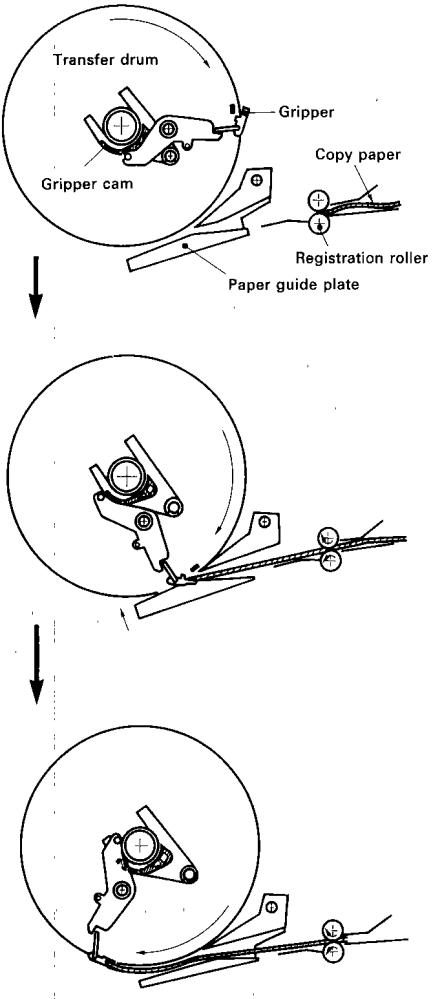

Figure 3-60

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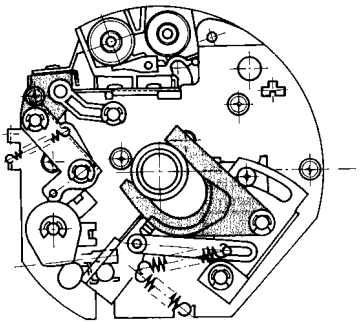
3. Gripper Cam Control

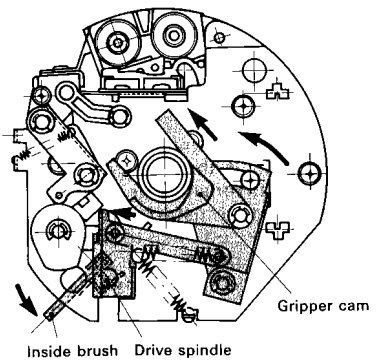
The gripper cam, inside brush, and push-up sheet are driven by the gripper motor (STM1).

The gripper cam and inside brush move away from the home position when the gripper motor rotates in normal direction. When the gripper motor rotates in reverse direction, on the other hand, they return to the home position.

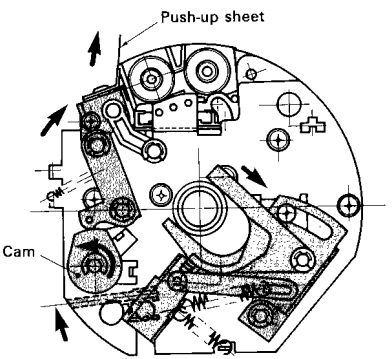
The push-up sheet moves only when the gripper motor rotates in reverse direction. Normally, the push-up sheet is at its lower position but is pushed up by the gripper motor during transfer.



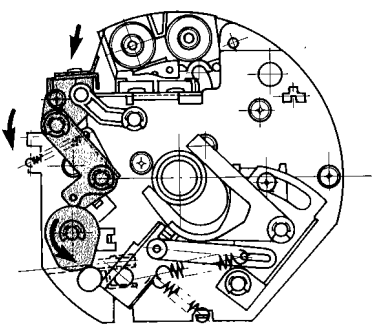
① In standby



② Gripper motor in normal direction



③ Gripper motor in reverse direction (push-up sheet being raised)



④ Gripper motor in normal direction (push-up sheet lowered)

Figure 3-61

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4. Transfer Drum Operation

After copying is complete, the transfer drum stops at the point where the grippers contact the photosensitive drum.

When copying starts, the transfer drum turns until a TRANSFER DRUM HOME POSITION signal (TDHP) is generated. At this point, the PICK-UP ROTATION (PKUPR) begins.

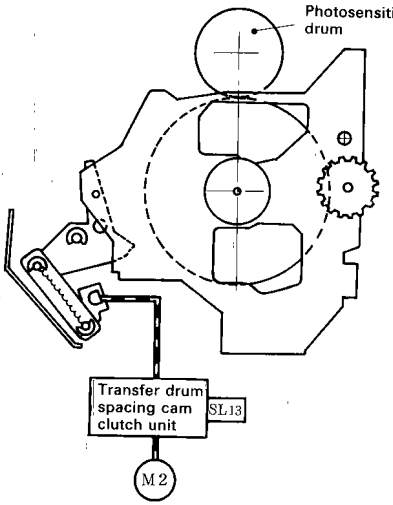
When copies are being made on paper of a size larger than A4/Letter, the following processes also occur.

One color developing and transfer is performed during the first rotation of the transfer drum.

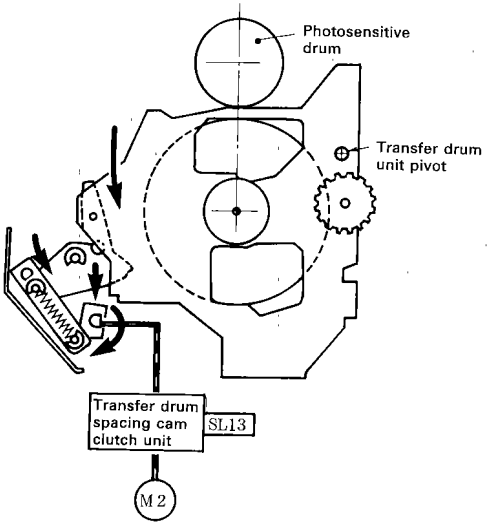
The second rotation of the transfer drum is idle rotation. If the transfer drum contacted the photosensitive drum at this time, the toner already transferred to copy paper could be transferred back to the photosensitive drum. To prevent this, the transfer drum spacing cam is turned (driven by motor M2 via a clutch operated by SL13) to separate the transfer drum from the photosensitive drum until the next transfer operation. (The transfer drum continues rotating.)

Reference

On the second rotation of the transfer drum, the developing unit turret is rotated to bring the next developing unit into position.



① SL13 OFF
(transfer drum in contact)



② SL13 ON
(transfer drum not in contact)

Figure 3-62

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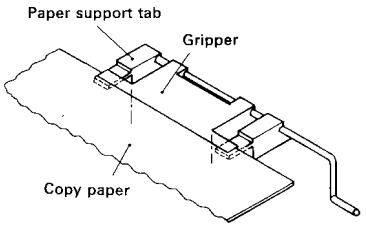
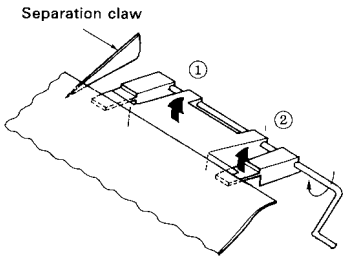
5. Separation

When transfer is completed, the gripper motor (STM1) goes ON. This releases the gripper and causes the paper support tabs to lift the end of the copy paper. Simultaneously, separation motor (STM2) goes ON, bringing the separation claw into contact with the transfer drum, where it lifts the end of the copy paper away from the transfer drum.



① During transfer



② For separation

Figure 3-63

6. Transfer Drum Cleaning

The sheet of the transfer drum is cleaned by a rotating brush (driven by brush motor M11) external to the transfer drum. This brush is brought into contact with the sheet by brush solenoid (SL15), and it cleans the sheet as it rotates.

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7. Sequence

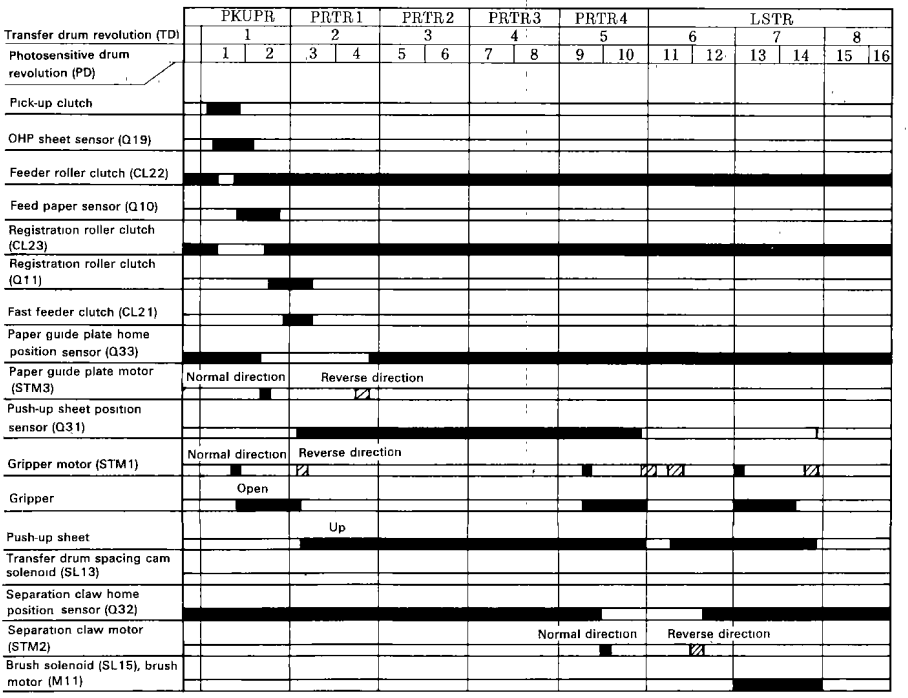

Figure 3-64 Transfer drum operation sequence for A4 full color copy (single rotation mode)

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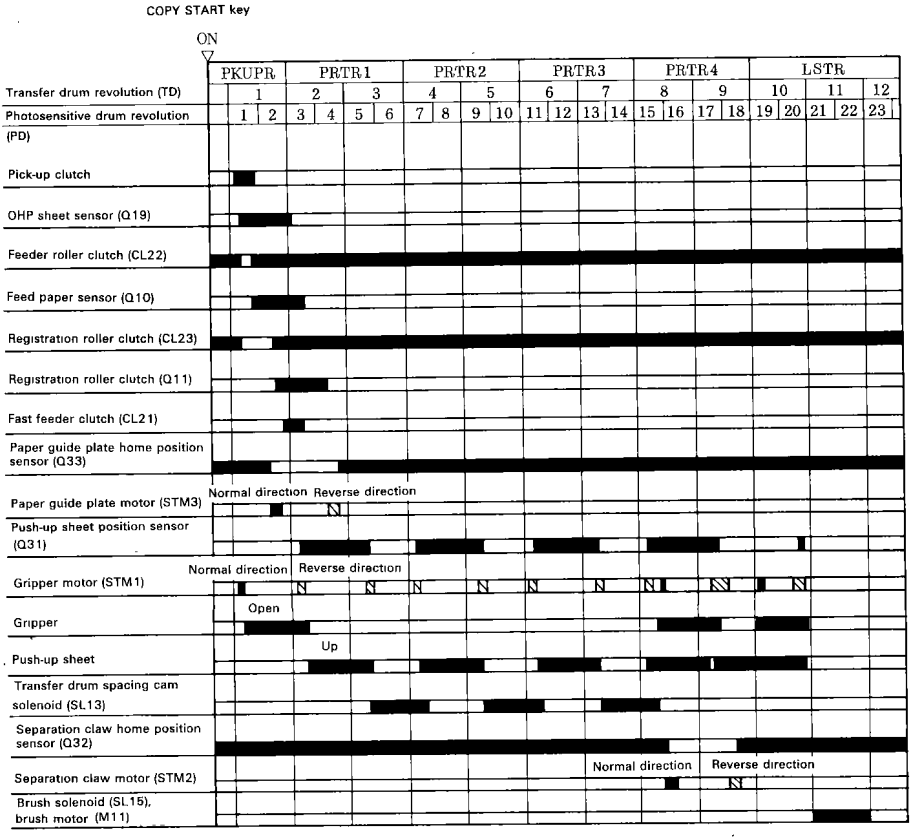

Figure 3-65 Transfer drum operation sequence for non-A4 full color copy (2-rotation mode)

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F. Feeder Unit

The copy paper separated from the transfer drum is sent through the feeder unit to the fixing assembly. When the leading edge of the paper reaches the inlet to the fixing assembly, the speed of the feeder belt is shifted to suit the speed of the fixing assembly.

	1	2	3
Feeder clutch 1 (CL19)	OFF	ON	OFF
Feeder clutch 2 (CL20)	ON	OFF	OFF
Speed	High	Medium	Low

Table 3-6

NOTE:
The high speed rotation is used to feed the copy paper through the feeder unit; the medium speed rotation is for fixing on plain paper. The low speed rotation is used for transfer on OHP sheets, at time of pick-up and transfer.

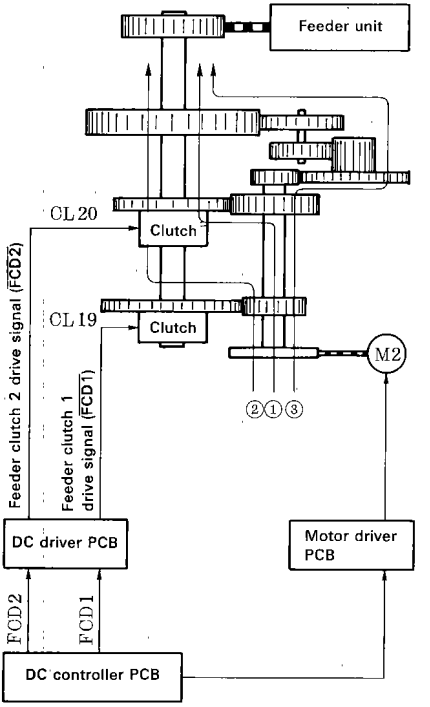

Figure 3-66

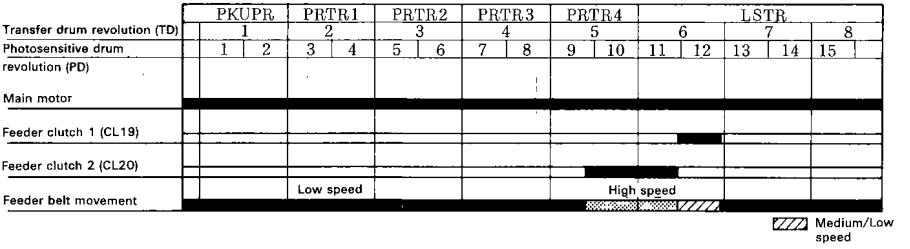

Figure 3-67 A4, full color

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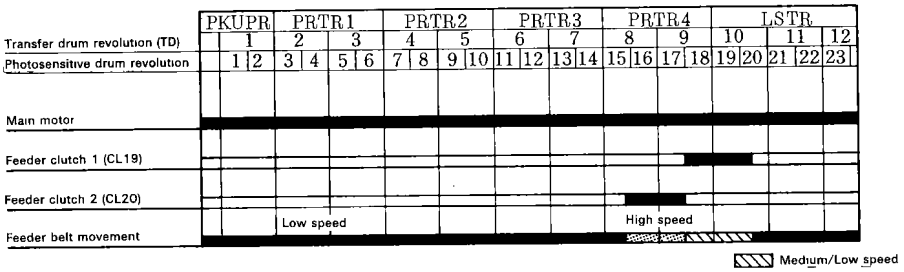

Figure 3-68 Non-A4, full color

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G. Fixing Assembly and Delivery Unit

1. Outline

The upper roller and lower roller of the fixing assembly are driven by the main motor (M2). The fixing roller rotates in two speeds which are switched to suit the type of copy paper.

The fixing roller normally rotates at medium speed; when the OHP sheet sensor (Q19) detects OHP sheet, however, it is shifted to low speed. The low-speed rotation is about 22% of the medium speed.

Each of the upper and lower rollers are equipped with a heater; as to the fixing temperature, the surface temperature of the lower roller is checked by a thermistor (TH1) and controlled by the DC controller PCB.

The oil applying solenoid (SL6) goes ON during copy operation to bring the oil applying roller in contact with the upper roller; this application of oil on the roller serves to prevent offset.

The oil inside the oil pan is checked by the oil level detection circuit and, when the oil runs out, the oil out signal ($\overline{OEP}$) is sent to the DC controller, which in turn turns the C indicator ON. The length of the cleaning belt is checked by the cleaning belt length sensor (Q25) and, when the belt runs out, the cleaning belt out signal (CBOUT) is sent to the DC controller PCB. The BELT OUT message is indicated on the control panel of the image scanner unit; the E indicator goes ON at the 4,000th copy (approx.) after the message is indicated.

NOTE:
Wait-up temperature
- CLC 500 ..... 150°C
- CLC 550 ..... 142°C

Control temperature ..... 150°C
Heaters (H1, H2) ..... 400 W
When the STANDBY key is pressed on the image scanner unit, the indicator on its control panel goes OFF but the control temperature for fixing will not change.

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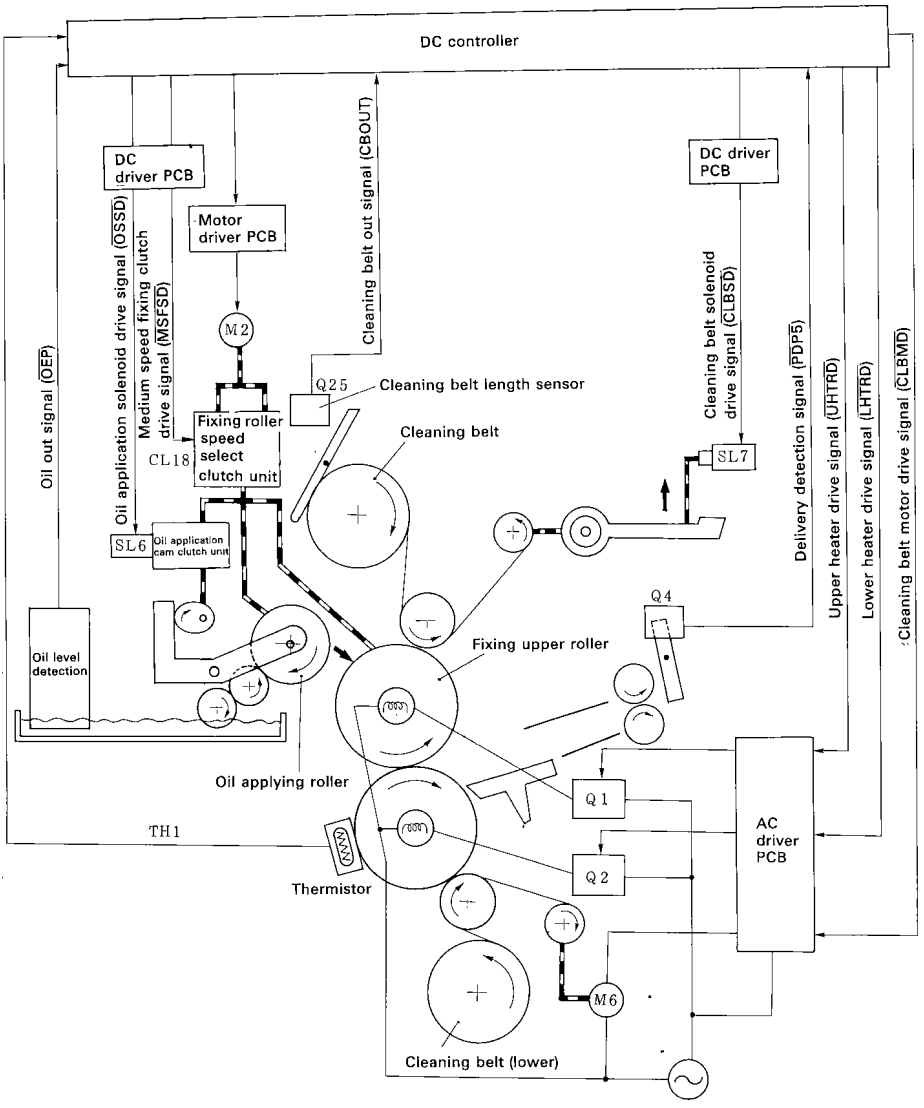

Figure 3-69

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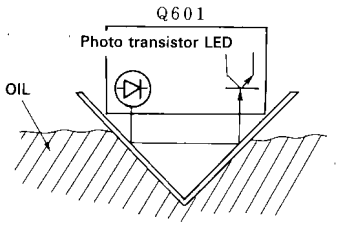
2. Oil Reservoir Level Sensing

The level of silicone oil in the oil pan is sensed by the LED-photo transistor unit shown in Figure 3-70 and the comparator circuit in Figure 3-72.

By a law of optics, a sheet of transparent material with one surface in contact with a liquid will reflect all light striking the other surface at any angle larger than a critical angle. If the oil pan is full, oil will contact the outer surfaces of the sensor, and the light from the LED will be reflected to the photo transistor PT. The PT will go ON (low resistance).



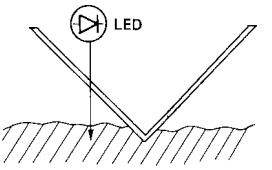
:Sufficient silicone oil

Figure 3-70

The PT and LED are connected in the comparator circuit shown in Figure 3-72. When light strikes PT, it pulls Q602-3 low, so

Then, Q602-2 > Q602-3
→Q602-1 is 1
→LED601 OFF
→ $\overline{OEP}$ = 1

If there is insufficient silicone oil in the oil pan, no oil will contact the outside of the sensor unit, and the light from the LED will pass through it.



Insufficient oil

Figure 3-71

Then, Q602-2 < Q602-3
→Q602-1 is 0
→LED601 ON
→ $\overline{OEP}$ = 0

This informs the DC controller that there is not enough oil, so it lights the OIL OUT indicator on the control panel.

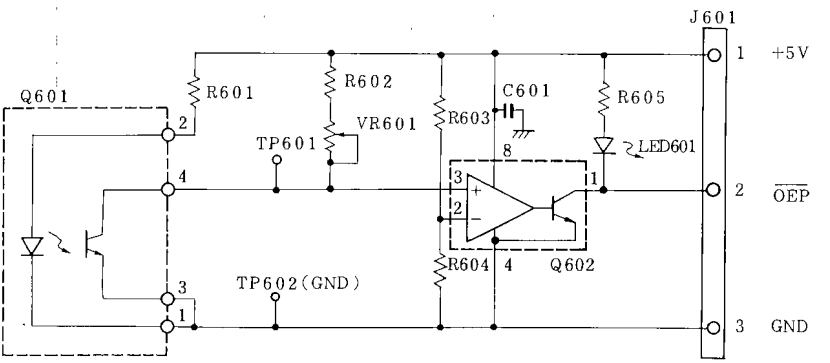


Figure 3-72

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3. Operations

The cleaning belt (upper) solenoid (SL7) is driven once every 15 copies.

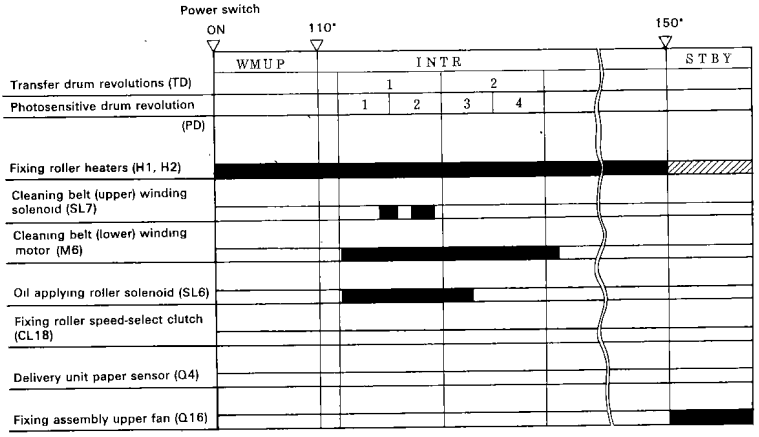

Figure 3-73 Power-on

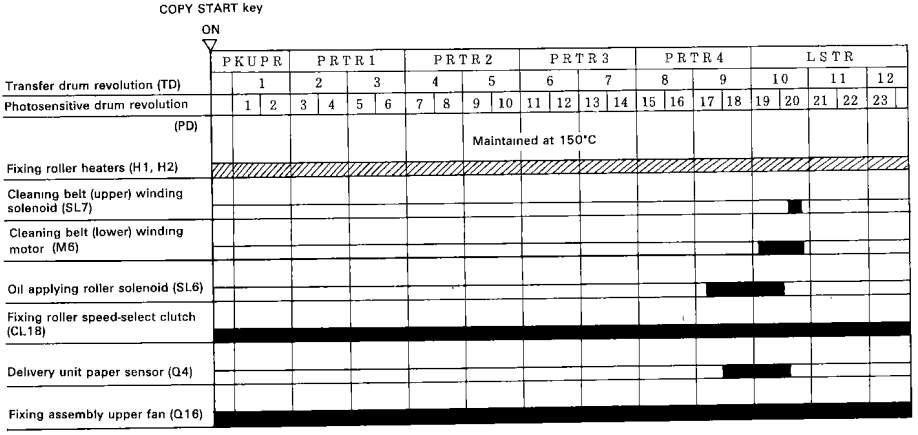

Figure 3-74 Non-A4/Letter, full color

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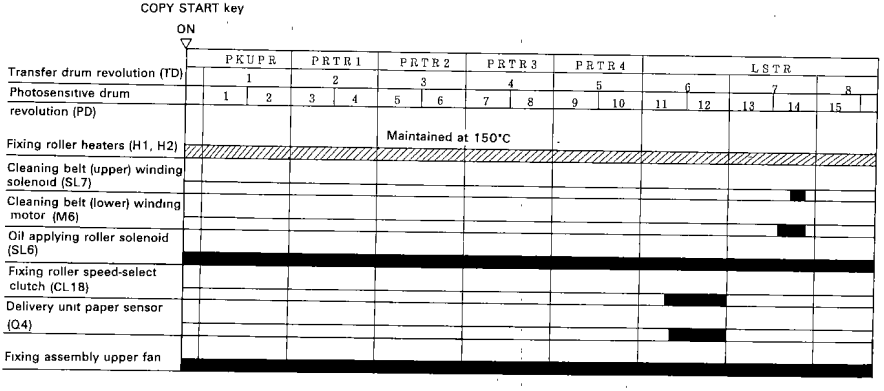

Figure 3-75 A4/Letter, full color; or, A4, full color, manual (2nd side of two-sided copy)

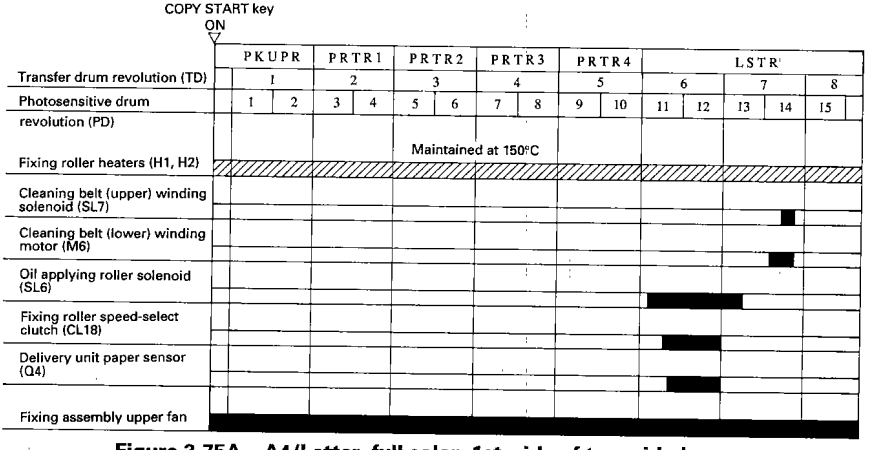

Figure 3-75A A4/Letter, full color, 1st side of two-sided copy

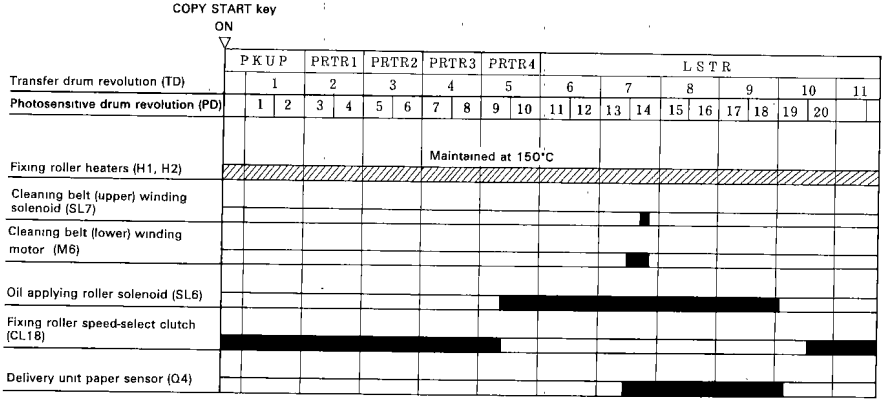

Figure 3-76 A4/Letter size OHP sheet, full color

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H. Jam Detection System

Paper sensors are located through the printer to detect whether the copy paper is moving correctly. Presence of a sheet of paper at a sensor is identified by a signal to the microprocessor.

If the microprocessor identifies a jam, copying operation stops, the main and drum motors stop, and the fixing roller heaters go OFF.

The microprocessor identifies a paper jam in the following cases.

a. The copy paper does not reach the feed roller paper sensor (Q10) at the required time.
b. The copy paper does not reach the registration roller paper sensor (Q11) at the required time.
c. The copy paper is not wound around the transfer drum or the orientation of OHP sheets is wrong and they are sensed by the transfer drum paper sensor (Q18) at the required time.
d. The copy paper is not separated from the transfer drum and sensed by the separation unit paper sensor (Q17) at the required time.
e. The copy paper does not reach the delivery unit paper sensor (Q4) at the required time.
f. The copy paper does not pass delivery unit sensor (Q4) at the required time.

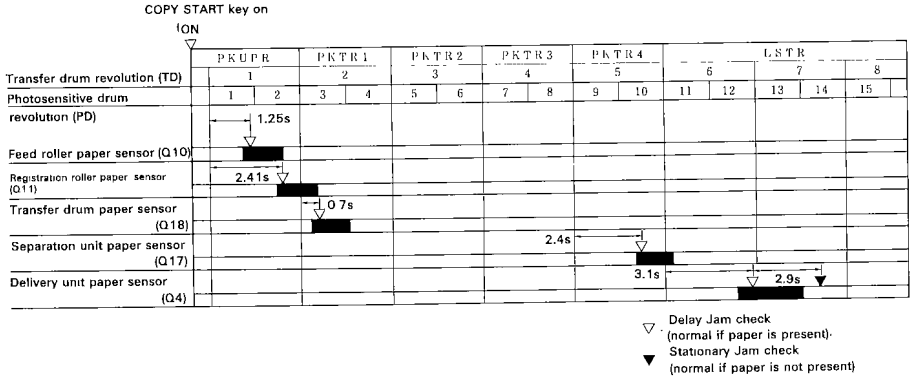

Figure 3-77 A4/Letter, full color

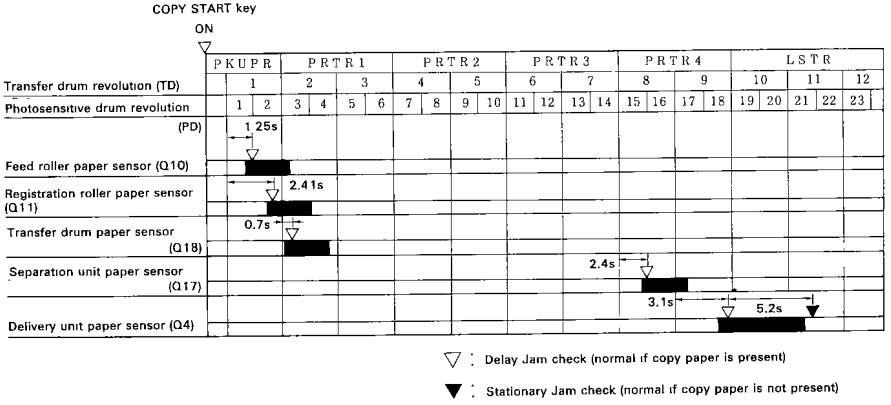

Figure 3-78 Other than A4/Letter, full color

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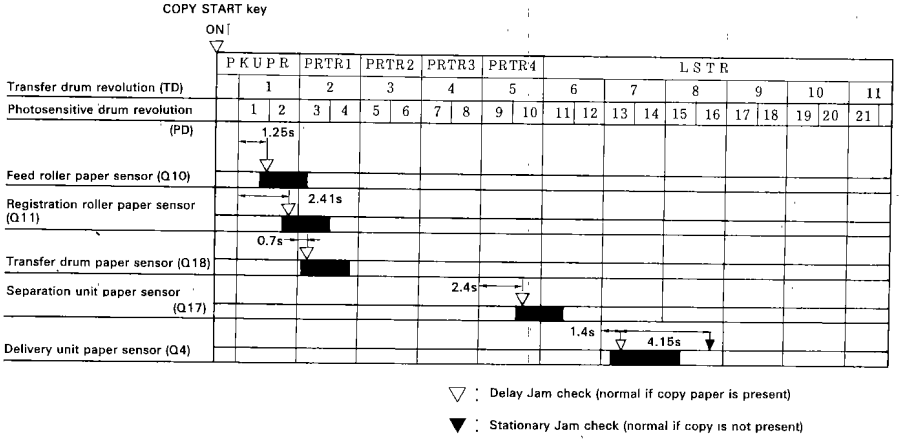

Figure 3-79 OHP sheet, full color

After the power has been turned ON, if transfer drum paper sensor Q18 detects copy paper on the transfer drum during initial rotation (INTR), the copy paper is delivered out in the copy sequence shown in Figure 3-80.

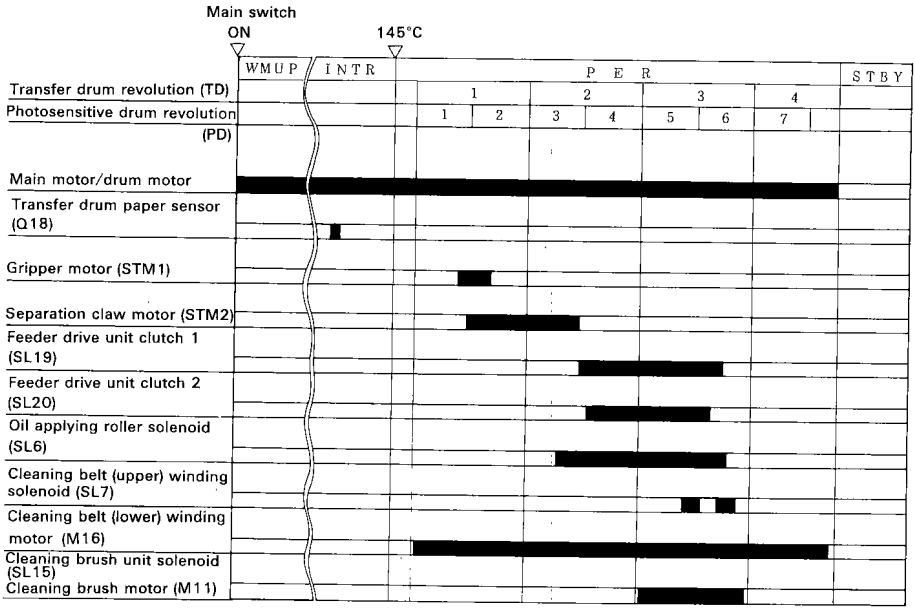

Figure 3-80

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V. POWER SUPPLY

A. Layout

Figure 3-81 shows all the power supplies in the printer unit.

When the power switch is set ON, AC line voltage is applied to the DC power supply PCB, which supplies DC voltages: 24 VDC, 12 VDC, – 12 VDC, 5 VDC, – 5VDC to various parts of the machine.

B. Protective Measures

The DC power supply is protected by a fuse in the AC input line, and by an overcurrent protection circuit in each DC output which cuts off current in the event of excessive current flow due to a fault.

If such a protective circuit operates, set the main power switch OFF, eliminate the cause of the problem (leave the switch OFF for a minimum of 30 seconds), then switch the power back on. This procedure resets the protective circuit.

If the problem is not corrected and the system is repeatedly reset, the fuse in the AC line will blow.

J803-3 of the DC power supply PCB outputs +5 V, which is input to J805-10. This output/input is used to check that the DC output of the DC power supply PCB is normal; if the DC output is not normal, all outputs from the DC power PCB will be cut off.

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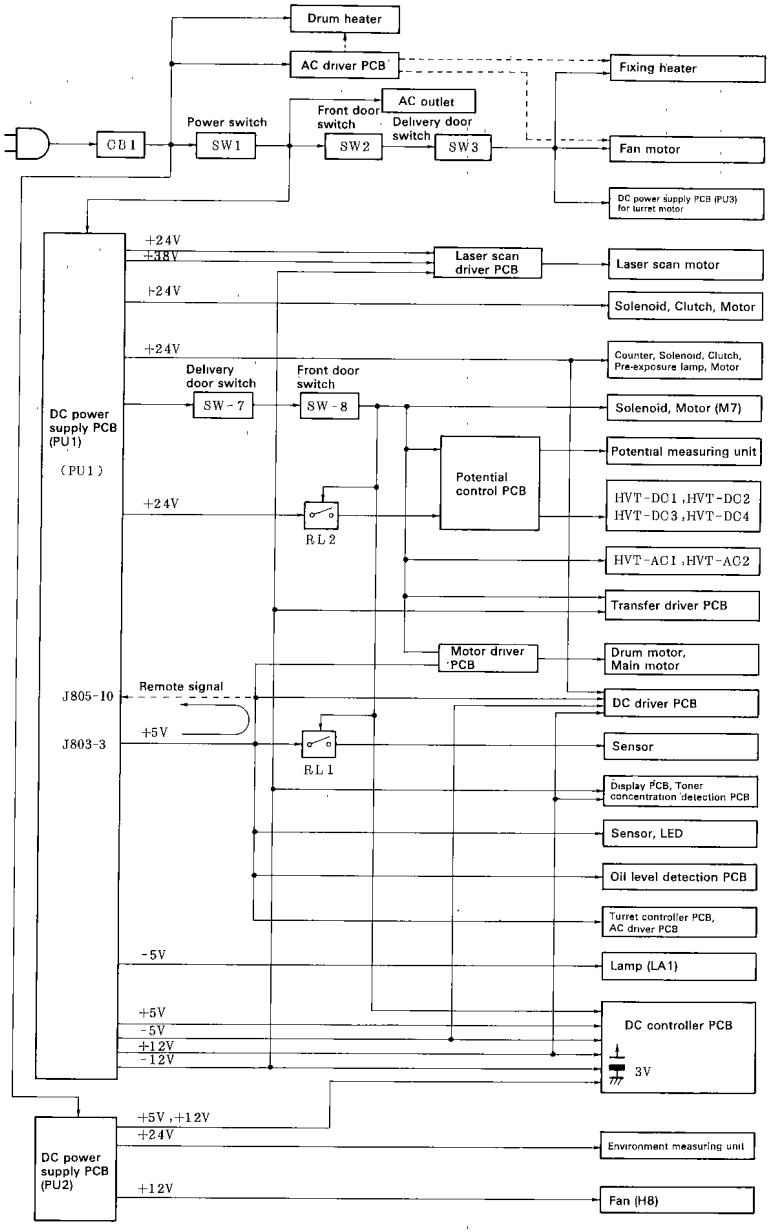

Figure 3-81

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VI. SCREEN PROCESSING

Screen processing prepares screens for multi-color printing from the document, and the operation is automatic.

The printing density is determined by the percentage of dots (Figure 3-82) on a screen, and the arrangement of these dots is called screen processing.

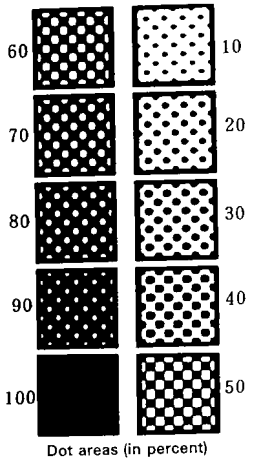

Figure 3-82

The video signals sent from the image scanner unit are put into the DC controller PCB.

The DC controller PCB processes black mono copies to prepare a screen for each color.

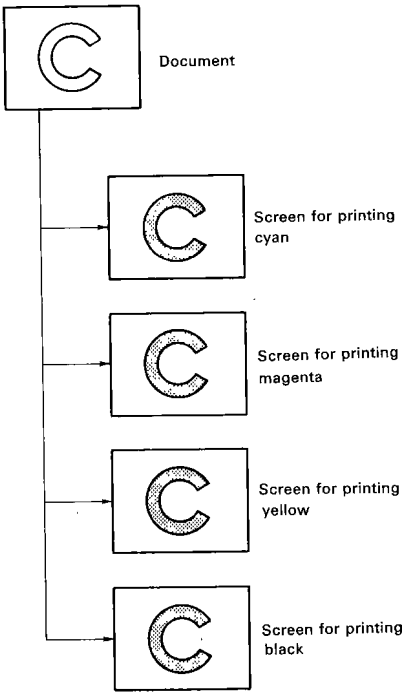

Figure 3-83

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VII. SERVICE MODE

A. Operations in the Service Modes

The four printer SERVICE modes listed below are available. Each is selected and used in a similar manner, as described immediately below. The individual modes are described in the following sections.

No.	Mode*
☒1☒	DISPLAY mode (L100)
☒3☒	ADJUSTMENT mode (U100)
☒4☒	SWITCH mode (P100)
☒6☒	COUNTER READING mode (h100)

* Samples in parentheses.

Table 3-7

The operations of the printer and scanner SERVICE modes are performed independently.

1) Open the front door and remove the display PCB cover.
2) Insert the door switch actuating tool into the door switch unit.
   Set the paper size, reproduction ratio, etc., if adjustments are to be made during copying operation.
3) Press the keys required to select the desired SERVICE mode (see Table 3-7).

   Example: ☒ → 3 → ☒

4) Select the address for the desired reading, test, adjustment, etc.

   Example: ☒ → 1 → 2 → 3 → ☒

5) Perform the check, adjustment, etc.

- A copy operation will be performed in any setting if the TEST PRINT key is pressed.
- To exit the SERVICE mode, press C twice.

Note:
The switches on the display PCB are assigned numbers 0 through 7; addresses 8 and 9, therefore are not used and are excluded from the description.

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B. Display Mode

1. Press ☒□□□☒ to select the desired address. L□□□0 address
   The display will have the following format:
   L0000
   └—"0", "1" or data values are displayed.
   Press [INV] to display the address.
2. Press [+/−] to increase the selected address.
   • Press [+/−] while pressing the [INV] key to decrease the selected address.
3. Press [C] to exit the DISPLAY mode.

Address	Display	Connector No.	Signal name	Remarks
L100	CONTROL KEY SENSOR SIGNAL	J101-9B	KEYL	0: Control key is in place.
L101	Front door and delivery door position sensor	J101-16B	$\overline{DRO}$	1: Door is closed.
L102	Unused			
L103	Left and rear panel position sensor	V114-4A	RCVRC	0: Panel is closed.
L104	TEST PRINT key signal	J101-10B	$\overline{TPRT}$	0: Switch is pressed.
L105	Unused			
L106	Communications with potential control PCB	–	–	Press the TEST PRINT key. 1: Communication with potential control PCB is normal.
L107 L113	Unused	–	–	
L114	Fixing roller heater temperature sensor	–	–	0: Fixing roller temperature is above 190°C.
L115	Unused	–	–	
L116	Fixing roller thermistor continuity sensor	J101-6B	–	1: Connector is not connected.
L117 – L119	Unused	–	–	
L120	STATUS RECEIVED signal	J108-33	SRR	0: Ready.
L121	START signal	J108-41	START	1: PRINT command being sent from image scanner.
L122	Unused	–	–	
L123	Scanner power ready signal	J108-39	CPRY	1: When communications with image scanner are enabled.
L124	BD signal	–	$\overline{BDRDY}$	0: BD signal OK.
L125	BD signal error	–	BDRDY	0: BD signal fault.
L126	Peltier element ready	–	$\overline{PLTRDY}$	0: Peltier element functioning correctly.

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Address	Display	Connector No.	Signal name	Remarks
L127	Scanning mirror ready	–	$\overline{SCNRDY}$	0: Scanning mirror speed correct.
L130	MAGENTA TONER OUT signal (Q21/Q28)	J114-6A	$\overline{MTEP}$	0: No toner.
L131	CYAN TONER OUT signal (Q20/Q27)	J114-7A	$\overline{CTEP}$	0: No toner.
L132	YELLOW TONER OUT signal (Q22/Q29)	J114-8A	$\overline{YTEP}$	0: No toner.
L133	BLACK TONER OUT signal (Q23/Q30)	J114-9A	$\overline{BKTEP}$	0: No toner.
L134	Turret is about to stop	J102-10A	PEND	0: Turret is about to stop.
L135	Turret has stopped	J102-9A	END	0: Turret has stopped.
L136	Turret motor over current detection signal	J102-8A	MOL	0: Over current detected.
L137 – L139	Unused	–	–	
L140	TURRET HOME POSITION signal (Q13)	J114-10B	RHP	1: At the home position.
L141	TURRET LOCK SENSOR signal (Q12)	J102-8B	$\overline{RLP}$	1: Turret is locked.
L142	DEVELOPING MOTOR DRIVE signal	–	–	0: During reverse rotation.
L143	OIL OUT signal	J101-17B	$\overline{OEP}$	0: No silicone oil.
L144	CLEANING BELT OUT signal (Q25)	J101-15B	$\overline{CBOUT}$	0: No cleaning belt left.
L145	COUNTER signal	–	–	1: Counter disconnected.
L146	ANGL signal (turret)	J102-11B	$\overline{ANGL}$	0: Rotation prohibited.
L147	Power ON/OFF check			0: Power OFF.
L150	UPPER CASSETTE SIZE IDENTIFICATION SWITCH signal	J101-1A	UCSZ3	1: SW704U ON.
L151	UPPER CASSETTE SIZE IDENTIFICATION SWITCH signal	J101-2A	UCSZ2	1: SW703U ON.
L152	UPPER CASSETTE SIZE IDENTIFICATION SWITCH signal	J101-3A	UCSZ1	1: SW702U ON.
L153	UPPER CASSETTE SIZE IDENTIFICATION SWITCH signal	J101-4A	UCSZ0	1: SW701U ON.
L154	LOWER CASSETTE SIZE IDENTIFICATION SWITCH signal	J101-5A	LCSZ3	1: SW704L ON.
L155	LOWER CASSETTE SIZE IDENTIFICATION SWITCH signal	J101-6A	LCSZ2	1: SW703L ON.
L156	LOWER CASSETTE SIZE IDENTIFICATION SWITCH signal	J101-7A	LCSZ1	1: SW702L ON.
L157	LOWER CASSETTE SIZE IDENTIFICATION SWITCH signal	J101-8A	LCSZ0	1: SW701L ON.
L160	Upper cassette paper out sensor (Q6) signal	J101-1B	$\overline{UPEP}$	0: Paper out.

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Address	Display	Connector No.	Signal name	Remarks
L161	Lower cassette paper out sensor (Q7) signal	J101-2B	$\overline{\text{LPEP}}$	0: Paper out.
L162	Feed roller paper sensor (Q10) signal	J101-10A	PDP1	1: Paper present.
L163	Registration roller paper sensor (Q11) signal	J101-11A	PDP2	1: Paper present.
L164	Upper cassette lifter position sensor (Q8) signal	J101-3B	ULFTP	1: Lifter raised.
L165	Lower cassette lifter position sensor (Q9) signal	J101-4B	LLFTP	1: Lifter raised.
L166	Manual feed unit paper sensor (Q5) signal	J101-5B	MFS	1: Manual feed selected.
L167	Delivery unit paper sensor (Q4) signal	J101-8B	$\overline{\text{PDP5}}$	0: Paper present.
L170	DRUM MOTOR (M1) SPEED SENSOR signal	J102-4B	$\overline{\text{DPLL}}$	0: Motor running at correct speed.
L171	MAIN MOTOR (M2) SPEED SENSOR signal	J102-5B	$\overline{\text{MPLL}}$	0: Motor running at correct speed.
L172	TRANSFER DRUM HOME POSITION SENSOR (Q16) signal	J104-3B	$\overline{\text{TDHP}}$	0: Drum home position.
L173	IMAGE EDGE LEADING SENSOR (Q15) signal	J104-2B	$\overline{\text{ILEG}}$	0: Light-blocking plate is inside sensor.
L174	SEPARATION UNIT PAPER SENSOR (Q17) signal	J104-6B	PDP4	1: Paper present.
L175	TRANSFER DRUM PAPER SENSOR (Q18) signal	J104-7B	PDP3	1: Paper present.
L176	WASTE TONER SENSOR (Q26) signal	J114-1A	WTOFP	1: Waste toner receptacle full.
L177	OHP FILM SENSOR (Q19) signal	J101-9A	$\overline{\text{OHPDP}}$	0: OHP film is detected.

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Address	Display	Remarks
L200	Contrast potential setting while M developing	|VD – 150 – VL| = contrast potential
L201	Contrast potential setting while C developing	
L202	Contrast potential setting while Y developing	
L203	Contrast potential setting while BK developing	
L204	Vback voltage setting while M developing	Standard: – 150
L205	Vback voltage setting while C developing	
L206	Vback voltage setting while Y developing	
L207	Vback voltage setting while BK developing	
L210	Dark area measured VD1 potential (VG = – 300V)	320 to 420 (approx.)
L211	Light area measured VL1 potential (VG = – 300V)	60 to 110 (approx.)
L212	Dark area measured VD2 potential (VG = – 600V)	610 to 710 (approx.)
L213	Light area measured VL2 potential (VG = – 600V)	110 to 170 (approx.)
L274	Dark area measured VD3 potential (VG = – 800V)	780 to 860 (approx.)
L275	Light area measured VL3 potential (VG = – 800V)	150 to 210 (approx.)
L214	Drum surface potential	Displayed in realtime.
L215	Copier inside temperature	°C
L216	Copier inside humidity	%
L217	Unused	
L220	M development VD target value	Target varies according to environment. Manual contrast 3: 600 to 700
L221	C development VD target value	
L222	Y development VD target value	
L223	BK development VD target value	
L224	M development VL target value	Target varies according to environment. Manual contrast 3: 100 to 250
L225	C development VL target value	
L226	Y development VL target value	
L227	BK development VL target value	
L230	M development grid bias	Manual contrast 3: 550 to 650
L231	C development grid bias	
L232	Y development grid bias	
L233	BK development grid bias	
L234	M development developing bias	Manual contrast 3: 450 to 600
L235	C development developing bias	
L236	Y development developing bias	
L237	BK development developing bias	

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Address	Display	Remarks
L240	Standard density value for M developer	Sets the standard value when starter developer is poured; the value remains the same unless the density is adjusted once again. The median value is about 2 V.
L241	Standard density value for C developer	
L242	Standard density value for Y developer	
L243	Standard density value for BK developer	
L244	M developer measurement at initial with blue filter	Measurement taken during density adjustment when starter developer is poured; the value remains the same unless the density is adjusted once again. The median value is about 2 V.
L245	C developer measurement at initial with blue filter	
L246	Y developer measurement at initial with blue filter	
L247	BK developer measurement at initial with blue filter	
L250	M developer measurement at initial with black filter	Measurement taken during density adjustment when starter developer is poured; the value remains the same unless the density is adjusted once again. The value is 400 ±0.20 V.
L251	C developer measurement at initial with black filter	
L252	Y developer measurement at initial with black filter	
L253	BK developer measurement at initial with black filter	
L254	Density of M developer during copy operation	Density of the developer calculated based on the value measured during copy operation; the value is compared against L240 through L243 to determine the amount of toner to be supplied. The median value is about 2 V.
L255	Density of C developer during copy operation	
L256	Density of Y developer during copy operation	
L257	Density of BK developer during copy operation	
L260	Measurement of M developer with blue filter during copy operation	Measurements taken during each copy. The median value is about 2 V or somewhat less.
L261	Measurement of C developer with blue filter during copy operation	
L262	Measurement of Y developer with blue filter during copy operation	
L263	Measurement of BK developer with blue filter during copy operation	
L264	Measurement of M developer with black filter during copy operation	Measurements taken during each copy. The median value is about 4 V or somewhat less.
L265	Measurement of C developer with black filter during copy operation	
L266	Measurement of Y developer with black filter during copy operation	
L267	Measurement of BK developer with black filter during copy operation	
L270	Correction value of L264	The median value is about 4 V.
L271	Correction value of L265	
L272	Correction value of L266	
L273	Correction value of L267	

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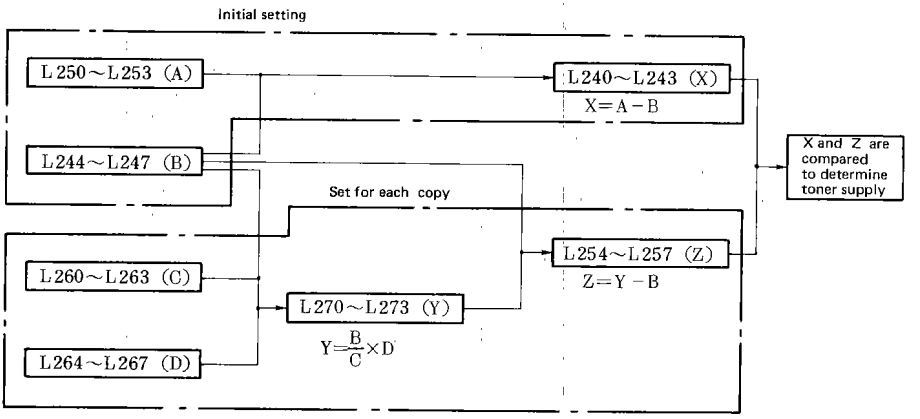

Address	Display	Remarks
L274	Dark area measured VD3 potential (VG = -800V)	780 to 860 (approx.)
L275	Light area measured VL3 potential (VG = -800V)	150 to 210 (approx.)
L276	White area potential	V_G = -500V Displayed after potential control (P101).
L277	White back grand area potential (VD)	
L278 - L315	Unused	
L316	Fixing roller temperature (°C)	
L317	DC controller Q164 version number	
L318 - L329	Unused	
L330	Meaning of E020 indication (M developer)	Refer to Table 3-8.
L331	Meaning of E020 indication (C developer)	Refer to Table 3-8.
L332	Meaning of E020 indication (Y developer)	Refer to Table 3-8.
L333	Meaning of E020 indication (BK developer)	Refer to Table 3-8.
L334	Meaning of E061 indication.	Refer to Table 3-9.
L335	Meaning of E021 indication.	Refer to Table 3-10.
L336	Meaning of E000 indication.	Refer to Table 3-11.
L337	Meaning of E072 indication.	Refer to Table 3-12.
L340	Meaning of E101 indication	Refer to Table 3-13.

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Indication	Meaning
000	No error
001	Reading for address L260, L261, L262 or L263 is lower than required (about 0.3).
002	Reading for address L260, L261, L262 or L263 is higher than required (about 3.5).
003	Reading for address L260 and L264, L261 and L265, L262 and L266, or L263 and L267 were identical four times or more in succession.
004	Reading for address L260 is less than half that for L244 (likewise for L261/L245, L262/L246, L263/L247).
005	Toner concentration does not reach the required value even after 20 or more toner-replenishing rotations of the transfer drum (A4 3-color or R copies).
006	Reading for address L254 is less than that for L240 (likewise for L255/L241, L256/L242, L257/L253) for more than 30 copies in succession.
008	If the difference between the maximum and minimum measurements upon execution of P135 of the service mode during density adjustment is about 0.3 V or more.

Table 3-8 Meaning of E020 indication

Indication	Meaning
000	No error
001	Difference between VD1 and VD2 is 50 V or less.
002	VD1 and VD2, VL1 and VL2 are identical.
003	VD2 and VD3, VL2 and VL3 are identical.
007	Grid bias is at upper limit.
008	Developing bias is at upper limit.
009	VD1, VD2, and VD3 are all 20 V or less.
010	VD1 is 600 V or more; or, the difference between VD1 and VD2 is 70 V or less.
011	VD1, VD2, and VD3 are all 100 V or less.
012	VD1, VD2, and VD3 are all 900 V or more.
013	The difference between VD1 and VL1, VD2 and VL2, or VD3 and VL3 is 100 V or less.

Table 3-9 Details of the E061 indication

Indication	Meaning
000	No error
001	Turret release sensor (Q12) does not sense that turret has been released.
002	PEND signal does not change to "1".
003	PEND signal does not change to "0".
004	Turret release sensor (Q12) does not detect that turret has been locked.
005	TURRET AT HOME POSITION signal is not generated within 20 seconds.
006	END signal does not change to "0".
008	Overcurrent is detected.

Table 3-10 Details of the E021 indication

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Indication	Meaning
000	No error
004	Thermistor connector is unplugged.
005	Temperature of fixing roller is above 200°C.
006	Temperature of fixing roller does not reach 50°C within 2 minutes after power is switched on.

Table 3-11 Details of the E000 indication

Indication	Meaning
000	No error
001	If the signal of the push-up sheet position sensor fails to change from '0' to '1' and then to '0' at time of power-on.
002	If the separation claw home position sensor fails to go '1' at time of power-on.
003	If the paper guide home position signal fails to go '1' at power-on.

Table 3-12 Details of the E072 indication

Indication	Meaning
000	No error
001	Correction lens position signal fails to go '1' upon power-on.
002	Timing signal (AFT) for AF data transmission (in AF mode) is not received.

Table 3-13 Details of the E101 indication

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C. Adjustment Mode (✱3✱)

1. Press ✱□□□✱ to select an address.
   └ Address
   The indication will change to
   U□□□
   └ Setting
   Press INV to check the address number.
2. To increase the setting, press ✱ +/- +/- ✱
   └ The number increases by one each time this key is pressed.
   To decrease the setting, press ✱ INV +/- ✱
   └ The number decreases by one each time this key is pressed.
   Hold the INV key down while pressing +/-.
3. Press C to exit the ADJUSTMENT mode.

Address	Purpose	Range of value displayed	Operation/Remarks
U100	For cancelling, all setting made in ADJUSTMENT mode, and returning to standard values. (after ROM replacement)	–	Press ✱ +/- +/- ✱ to return to standard value.
U101	For selecting automatic or manual adjustment of target contrast potential.	–	0: Automatic (control by data from environmental sensor). 1: Manual (set to 1 through 5 by display PCB).
U102	Unused		–
U103	For selecting transfer corona current	1 – 5	See page 3-96
U104	For selecting poor image transfer	0 – 4	
U105	Unused		
U107	Clears the count reading of h100 through h107.	–	Returns to '0' by a press on ✱, +/- twice, and ✱.
U106	For contrast potential adjustment of all colors	±20 (variable in 5 units)	• Perform potential control (✱4✱✱1018✱1✱) after adjustment. • Effective when U101 is '0' (target contrast potential recognition is auto). unit: 5
U114	For contrast potential adjustment during M development		
U115	For contrast potential adjustment during C development		
U116	For contrast potential adjustment during Y development		
U117	For contrast potential adjustment during BK development		
U108 – U113 U117 – U120	Unused		

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Address	Purpose	Range of value displayed	Operation/Remarks
U121	For manually adjusting grid bias [redacted]	+20 to – 15	Increasing the setting increases the grid bias voltage.
U122	For manually adjusting developing bias [redacted]	+15 to – 15	Increasing the setting increases the developing bias voltage DC component.
U123 to U149	Unused	–	–
U143	For entering the median value for AF.		See page 3-97. Enter the value when the DC controller PCB is replaced or U100 is performed. Unit: 1
U150	For entering the value of L240	–	See page 3-94. Enter the developer density adjustment value when the DC controller PCB is replaced or U100 is performed. Unit: 0.02
U151	For entering the value of L241	–	
U152	For entering the value of L242	–	
U153	For entering the value of L243	–	
U154	For entering the value of L244	–	
U155	For entering the value of L245	–	
U156	For entering the value of L246	–	
U157	For entering the value of L247	–	
U162	For input of AF best focus position	+12 to – 12	See p. 2-18. After adjustment, record the reading of U143 on the label.
U164	For switching the pre-fixing corona unit (CLC 500 only)	–	Enter '1' to turn output of the pre-fixing corona unit OFF when copying on plain paper. • Always "1" if CLC 550.
U165	For switching oil application time	–	Change the setting to change the timing of oil application while copying on OHP. 0: -3 mm 1: 0 mm 2: +3 mm

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D. Switch Mode (✱ 4 ✱)

Note:
This mode is effective only in standby.

1. Press the following keys to select the address.
   ✱□□□✱
   └address
   The following will be displayed.
   P□□0
   Press INV to confirm the address.
2. Press 1 and ✱ to execute an operation. The following will be displayed.
   P□□1
   or H
   However, when the final part of the display is H, the machine will automatically complete the operation.
   To stop the operation press 0 ✱.
   Press ✱ 0 to repeat an operation.
   Press 0 ✱ to stop execution.
3. Press C to exit the SWITCH mode.

Address	Purpose	Operation	Remarks
P100	For adjusting the target contrast potential manually.	Set the 7-segment display for the desired color to the number for the required contrast (1 through 5) using the button below the display. Select P100, and press 1✱. The drum surface potential will be adjusted automatically.	Operation stops automatically after surface potential has been adjusted.
P101	For adjusting target contrast potential automatically.	Press 1✱. The surface potential will be adjusted automatically to suit the data from the environmental sensors.	Operation stops automatically after furface potential has been ajusted.
P102 P103	Unused	–	–
P104	For decreasing image density temporarily.	Use this adjustment if copy quality is poor when the machine is installed. Press 1✱. Five steps of image density can then be selected.	Several hours after this adjustment, the input data are cleared and the surface potential is again adjusted, using data from the environmental sensor.
P105	For increasing image density temporarity.		
P106	For registering the initial data of the environment sensor.	Press 0✱ to register the initial data.	
P107	For rewriting data.	Press 1✱ to rewrite RAM data.	Development data (P240 to P247) are not rewritten.
P110	For adjusting BD mirror.	Press 1✱ to switch the laser ON. Press 0✱ to switch the laser OFF. **Note:** **E100 is displayed if a BD error occurs while the laser is ON.**	Insert the door switch tool in the door switch unit to move aside the laser beam blocking plate.

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Address	Purpose	Operation	Remarks
P111	For laser check 1	A press on the [1] and [⊠] keys causes the laser to go ON. A press on the [0] and [⊠] keys causes the laser to go OFF.	–
P112	For laser check 2		
P113	For laser check 3		
P114	For laser check 4		
P115 – P119	Unused	–	–
P120	Cleaning transfer drum.	Press [1][⊠]. The transfer drum will be cleaned.	The machine stops automatically after cleaning.
P121	Cleaning primary corona wire.	Press [1][⊠]. The primary corona wire will be cleaned.	
P122	Driving primary corona wire cleaner forward.	Press [1][⊠]. The cleaner will move forward and stop at the back end of the primary corona unit.	Used for replacing the cleaner.
P123	Driving primary corona wire cleaner backward.	Press [1][⊠]. The cleaner will move backward and stop at the front end of the primary corona unit.	Used for replacing the cleaner.
P124	Magenta toner feedscrew clutch (CL5) ON.	Press [1][⊠]. The main motor will run and the clutch go ON for 1 sec to operate the feedscrew.	Turret rotates to bring required developing unit to the position for feeding toner. After toner has been added, turret returns to its home position.
P125	Cyan toner feedscrew clutch (CL6) ON.		
P126	Yellow toner feedscrew clutch (CL7) ON.		
P127	Black toner feedscrew clutch (CL8) ON.		
P130	For stirring the developer.	Press [1][⊠]. The main motor and turret motor will operate and stir the toner for approximately 3.5 minutes.	This time period is equal to making 16 full-color copies (A4/LTR).
P131	For increasing magenta developer concentration to standard.	Press [1][⊠]. The selected developing unit is moved to the development position. The lamp of the toner concentration sensor goes ON and the toner concentrations measured. The result is shown ON the 7-segment displays. Press [0][⊠]. The turret will returns to its home position. STANDBY is activated	See page 3-95.
P132	For increasing cyan developer concentration to standard.		
P133	For increasing yellow developer concentration to standard.		
P134	For increasing black developer concentration to standard.		
P135	Developer concentration measurement and registration.	Press [1][✳]. The main motor and rotator motor operate for approximately 3.5 minutes and measurement and registration are performed.	See page 3-95.

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Address	Purpose	Operation	Remarks
P136	Magenta developer concentration measurement and registration.	Press [1][Start] . The main motor and turret motor operate and measurement and registration of the specified developer concentration is performed for about 3.5 minutes.	
P137	Cyan developer concentration measurement and registration.		
P140	Yellow developer concentration measurement and registration.		
P141	Black developer concentration measurement and registration.	Press [1][Start] . The main motor and turret motor operate and measurement and registration of the specified developer concentration is performed for about 3.5 minutes.	
P142	For removing developer in the developing unit.	Press [1][Start] . The developer will be removed from the developing unit. Press [0][Start] after the developer has been removed.	
P143	For checking operation of turret by setting the magenta developing unit to the development position.	Press [1][Clear] . The turret rotates and moves the specified developing unit to the operating position.	
P144	For checking operation of turret by setting the cyan developing unit to the development position.		
P145	For checking operation of turret by setting the yellow developing unit to the development position.		
P146	For checking operation of turret by setting the black developing unit to the development position.		
P147	For checking operation of turret by setting the turret to its home position.		
P150	For setting all preconditioning exposure lamps ON.	Press [1][Start] . The preconditioning exposure lamps will go ON for 2 sec.	
P151	Unused	-	
P152	For toner applying mode (upon installation)	Press [1][Start] to apply toner to the drum.	
P153	For operating main motor.	Press [1][Start] to operate main motor. Press [0][Start] to stop main motor.	
P154	For operating drum motor.	Press [1][Start] to operate drum motor. Press [1][Start] to stop drum motor.	

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Address	Purpose	Operation	Remarks
P155	For operating developing unit drive motor.	Press [1] to operate developing unit drive motor. Press [0] to stop developing unit drive motor.	
P156	For operating oil applying roller solenoid (SL6).	Press [1] to operate SL6. Press [0] to stop SL6.	
P157	For operating toner concentration sensor lamp (LA1) and filter change solenoid (SL21).	Press [1] to operate LA1 and SL12. Press [0] to stop LA1 and SL12.	
P160	For operating primary corona and grid bias system.	Press [1] to cause high-voltage output. Press [0] to stop high-voltage output.	Pre-conditioning exposure lamps and drum motor operate simultaneously.
P161	For operating developing bias DC component system.	Press [1] to cause DC component output. Press [0] to stop DC component output.	
P162	For operating developing bias AC component system.	Press [1] to cause AC component output. Press [0] to stop AC component output.	
P163	For operating static charge eliminating corona (internal) DC component.	Press [1] to cause DC component output. Press [0] to stop DC component output.	The drum motor operates at the same time.
P164	For operating separation corona system.	Press [1] to cause high-voltage output. Press [0] to stop high-voltage output.	The drum motor operates at the same time.
P165	For operating static charge eliminating corona AC component system.	Press [1] to cause AC component output. Press [0] to stop AC component output.	The drum motor operates at the same time.
P166	For operating pre-fixing corona system.	Press [1] to cause high-voltage output. Press [0] to stop high-voltage output.	The drum motor operates at the same time.
P167	For operating transfer corona. (Output is '0' in the absence of paper)	Press [1] to cause high-voltage output. Press [0] to stop high-voltage output.	Primary corona, grid bias, pre-conditioning exposure lamps, and drum motor all operate simultaneously.
P170	For operating transfer corona (Low output).	Press [1] to cause high-voltage output press [0] to stop high-voltage output	
P171	For operating transfer corona (High output).		
P172	Pre-cleaning corona output.		No output
P173	Static eliminating DC component output.		Drum motor operates simultaneously

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Address	Purpose	Operation	Remarks
P174 – P199	Unused	–	
P200	For cancelling E000.	Press [1][X] to cancel E000.	
P201	For adjustment at the factory.	–	
P202	For inhibiting paper feed (paper is not fed).	Press [1][X] to inhibit the function. Press [0][X] to re-enable the function. **Note:** **P201 through P206 can be set in this way.**	If the service mode is exited, the settings are cancelled.
P203	For inhibiting turret operation (turret does not rotate).		
P204	For inhibiting jam detection (Jam detection is not performed).		
P205	For inhibiting toner concentration sensing (fixed amount of toner is supplied for each copy).		
P206	For inhibiting surface-adjustment potential (non-potential control; fixed output from all high-voltage transformers).		Variable by U121 and U122.
P207	For adjustment at the factory	–	
P208	Unused	–	
P209	Unused	–	
P210	For measuring nip width (fixing rollers).	Put a filled cassette (A4/letter) in the upper cassette holder. Press [1][X], then press the TEST PRINT key. Paper will automatically be fed, printed on, and held for about 5 sec between the fixing rollers, then delivered.	

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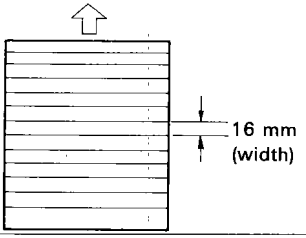
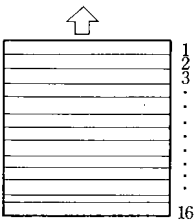
Address	Purpose	Operation	Remarks
P211 – P213	Unused	Press [1][X], then press the TEST PRINT key. The pattern will be printed automatically. 	Paper is dram, from the upper cassette see page 3-101P.
P214	16 mm wide horizontal stripe test print (pick-up from upper cassette).		
P215	16 mm wide horizontal stripe test print (pick-up from lower cassette).		
P216	Magenta developer 16-gradation test print.	Press [1][X], then press the TEST PRINT key. The 16-gradation pattern will be printed the specified color. 	Paper is drawn from the upper cassette. See page 3-102P.
P217	Cyan developer 16-gradation test print.		
P220	Yellow developer 16-gradation test print.		
P221	Black developer 16-gradation test print.		
P222	Unused		
P223	Halftone 1 test print. (light)	Press [1][X], then press the TEST PRINT key. A test print of the specified density is made.	• All the copies are produced in magenta. • Paper is drawn from the upper cassette.
P224	Halftone 2 test print.		
P225	Halftone 3 test print.		
P226	Halftone 4 test print. (dark)		
P227	3-color halftone test print.		
P230	64-color test print. See page 3-104P.	Press [1][X], then press the TEST PRINT key. A 64-color pattern test print is made.	• Paper is drawn from the upper cassette.
P231			
P232	Gray scale test print. See page 3-105P.	A press on the [1] and [X] keys and then on the TEST PRINT key copies the gray scale.	
P233	AF adjustment test print	A press on the [1] and [X] keys and then on the TEST PRINT key copies the AF adjustment Pattern.	

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Address	Purpose	Operation	Remarks
P234	For removing magenta toner in the hopper.	Remove the developer unit. Move the turret by hand to position the developing unit to be emptied to the required position. Press 1 ✳. The toner will be removed from the hopper. Press 0 * after the toner has been removed.	
P235	For removing cyan toner in the hopper.		
P236	For removing yellow toner in the hopper.		
P237	For removing black toner in the hopper.		
P240	Unused		
P241	Rotation of separation motor of transfer drum	Press 1 ✳ move the claw. Press 0 ✳ to move the claw its home position.	
P242	Rotation of paper guide motor of transfer drum	A press on the 1 and ✳ keys causes the motor to rotate and moves the paper guide. A press on the 0 and ✳ keys causes the paper guide to return to the home position.	
P243	AF check mode	A press on the 1 and ✳ keys activates the AF mechanism, and the deviation from the best focus position will be indicated.	See p. 3-100P.
P244	AF motor forward	A press on the 1 and ✳ keys causes the AF motor to rotate forward over a single step.	
P245	AF motor reverse	A press on the 1 and ✳ keys causes the AF motor to rotate in reverse over a single step.	
P246	AF best position shift mode	A press on the 1 and ✳ keys causes the AF motor to rotate, thereby shifting the lens to its best position.	
P250 P251 P252	Focus adjustment test print	A press on the 1 ✳, and TEST PRINT keys causes output of the focus adjustment pattern.	See p 3-100P.

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E. Counter Reading Mode (✱6✱)

1. Select the address number by pressing ✱□□□✱ .
   └Address number
   The display will change to h□□□ .
   └Counter reading
2. The counter indicates the total using two addresses.
   For example, when the indication is 3211 for address h100 and □112 for address h101, the count is 12321.
3. Press the C key to exit the COUNTER READING mode.
4. Use U107 to return h100 through h107 to '0'.

Address No.	Type of counter	Unit	Remarks
h100	M developing unit counter (low digits)	×1	Returns to 000000 after 999999 is reached.
h101	M developing unit counter (high digits)	×1000	Returns to 000000 after 999999 is reached.
h102	C developing unit counter (low digits)	×1	Returns to 000000 after 999999 is reached.
h103	C developing unit counter (high digits)	×1000	Returns to 000000 after 999999 is reached.
h104	Y developing unit counter (low digits)	×1	Returns to 000000 after 999999 is reached.
h105	Y developing unit counter (high digits)	×1000	Returns to 000000 after 999999 is reached.
h106	BK developing unit counter (low digits)	×1	Returns to 000000 after 999999 is reached.
h107	BK developing unit counter (high digits)	×1000	Returns to 000000 after 999999 is reached.
h110	M copy counter (low digits)	×1	Returns to 000000 after 999999 is reached.
h111	M copy counter (high digits)	×1000	Returns to 000000 after 999999 is reached.
h112	C copy counter (low digits)	×1	Returns to 000000 after 999999 is reached.
h113	C copy counter (high digits)	×1000	Returns to 000000 after 999999 is reached.
h114	Y copy counter (low digits)	×1	Returns to 000000 after 999999 is reached.
h115	Y copy counter (high digits)	×1000	Returns to 000000 after 999999 is reached.
h116	BK copy counter (low digits)	×1	Returns to 000000 after 999999 is reached.
h117	BK copy counter (high digits)	×1000	Returns to 000000 after 999999 is reached.
h120	R copy counter (low digits)	×1	Returns to 000000 after 999999 is reached.
h121	R copy counter (high digits)	×1000	Returns to 000000 after 999999 is reached.

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Address No.	Type of counter	Unit	Remarks
h122	G copy counter (low digits)	×1	Returns to 000000 after 999999 is reached.
h123	G copy counter (high digits)	×1000	Returns to 000000 after 999999 is reached.
h124	B copy counter (low digits)	×1	Returns to 000000 after 999999 is reached.
h125	B copy counter (high digits)	×1000	Returns to 000000 after 999999 is reached.
h126	3-color full-color copy counter (low digits)	×1	Returns to 000000 after 999999 is reached.
h127	3-color full-color copy counter (high digits)	×1000	Returns to 000000 after 999999 is reached.
h130	4-color full-color copy counter (low digits)	×1	Returns to 000000 after 999999 is reached.
h131	4-color full-color copy counter (high digits)	×1000	Returns to 000000 after 999999 is reached.
h132	Total copy counter (low digits)	×1	Returns to 000000 after 999999 is reached.
h133	Total copy counter (high digits)	×1000	Returns to 000000 after 999999 is reached.

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F. Adjustment

1. After Replacement of DC Controller PCB

Make the following adjustments when the DC controller PCB has been replaced.

Note:
Be sure to re-connect jumper connector J112 if the DC controller has been replaced.

1) Enter the adjustment mode under the service mode (✳ 3 ✳).
2) Select the following addresses, and enter the values (L240 through L247) recorded on the label during the adjustment of the toner concentration detection circuit using the +/− key.

Address	Values	Tolerance
U150	Enter the value of L240.	±0.01
U151	Enter the value of L241.	
U152	Enter the value of L242.	
U153	Enter the value of L243.	
U154	Enter the value of L244.	
U155	Enter the value of L245.	
U156	Enter the value of L246.	
U157	Enter the value of L247.	

Table 3-14

- A press on the +/− key increases the count by 0.02.
- A press on the +/− key while holding down the inv key decreases the count by 0.02.

3) Enter the best focus position in U143 of the service mode.
4) Press the C key twice.
5) Press the following keys so that the environment data is entered into the RAM.
   ✳ 4 ✳ ✳ 1 0 6 ✳ 1 ✳
6) Enter the service mode (✳ 4 ✳ ✳ 1 1 0 ✳ 1 ✳) and cause the laser to go ON.
7) Disconnect the fiber (brown) for AF from the DC controller PCB.
8) Measure the voltage (A; ref., −1 ~ +1 V) between TP106 (+) and TP100 (−) on the DC controller PCB.
9) Measure the voltage between TP107 (+) and TP100 (−) on the DC controller PCB; adjust VR105 so that the voltage will be voltage A + 0.05 V.
10) Connect the fiber for AF.
11) Measure the voltage between TP106 (+) and TP100 (−) on the DC controller PCB; adjust VR100 so that the voltage will be voltage A + 0.6 V.
12) Press 0 and ✳ to cause the laser to go OFF.
13) Set VR102 to the center.
14) Activate the AF check mode in the service mode (✳ 4 ✳ ✳ 2 4 ✳ 1 ✳).
15) Adjust VR102 so that the voltage between TP110 (+) and TP100 (−) will be 1.2 V.
16) Press the following keys in the service mode to activate potential control;
    ✳ 4 ✳ ✳ 1 0 1 ✳ 1 ✳
17) Make a copy, and check the image density.
    If the image is too light or dark, adjust it as follows:
    if too light, press ✳ 4 ✳ ✳ 1 0 5 ✳;
    and if too dark, press ✳ 4 ✳ ✳ 1 0 4 ✳
    A press on 1 and ✳ increases or decreases the density by a single level; up to five levels.
18) Press the C key twice.

2. After Replacement of ROM Q164 on the DC Controller PCB

Note:
Be sure to take notes of the settings under the service mode (✳ 3 ✳) before replacing the ROM.

1) Turn the power OFF, and disconnect the power plug; otherwise, +5 V would remain in the machine.
2) Remove the rear cover.
3) Pull off the old ROM from the DC controller PCB.
4) Fit the new ROM.
5) Connect the power plug, and turn the power ON.
6) Activate U100 of the service mode;
   ✳ 3 ✳ ✳ 1 0 0 ✳ ✳ +/− +/− ✳
   The activation of U100 changes the data used for fine-tuning the contrast to the initial values; re-set them.
7) Enter values under ✳ 3 ✳ .
8) Make a copy, and check the operation and image.

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3. Adjusting the Toner Concentration Detection Circuit

① Adjusting the Toner Concentration Detection Circuit of All Colors

Adjust the toner concentration detection circuit if any of the following conditions exists:

- When all toner has been replaced.
- When a PCB or toner concentration detection PCB has been replaced.
- When the lamp for toner concentration detection has been replaced.

1) Put starter developer in all developing assemblies, and mount the developing assemblies in the copying machine.
2) Press the [*][4][*][*][1][3][0][*] [1][*] keys on the display PCB so as to stir the starter developer inside the developing assemblies.
   The machine operates for about 35 minutes and stops automatically.
3) Press the [*][1][3][1][*][1][*] , and turn VR403 until the reading is 4.00 ±0.20 V to adjust the density of the M developer; the voltage is indicated on the display PCB.
4) Press the [0] and [*] keys after adjustment.
5) Press the [*][1][3][2][*][1][*] , and turn V405 until the reading is 4.00 ±0.20 V to adjust the C developer density.
6) Press the [0] and [*] keys after adjustment.
7) Press the [*][1][3][3][*][1][*] keys, and turn VR401 until the reading is 4.00 ±0.20 V to adjust the density of the Y developer.
8) Press the [0] and [*] keys after adjustment.
9) Press the [*][1][3][4][*][1][*] keys, and turn VR407 until the reading is 4.00 ±0.20 V to adjust the density of the BK developer.
10) Press the [0] and [*] keys after adjustment.
11) Press the [*][1][3][5][*][1][*] keys to register the values; the machine operates for 3.5 minutes and stops automatically.
12) Press the [C] key twice.
13) Select the following Nos., and check that the readings are 4.00 ±2.20 V.

Service mode ([*][1][*])	Developing assembly
[*][2][5][0][*]	M
[*][2][5][1][*]	C
[*][2][5][2][*]	Y
[*][2][5][3][*]	BK

Table 3-15

If any of the reading is not 4.00 ±0.20 V, adjust the reading once again and repeat step 11) and onward.

14) Select the following address, and record the readings on the label.

DATA	, ,	, ,	, ,	, ,
ADDRESS	INT			
L240				
L241				
L242				
L243				
L244				
L245				
L246				
L247				

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Table 3-16

Note:
The label is attached to the front cover of the hopper unit.

15) Press the [C] key twice.

② Adjusting the Toner Concentration Detection Circuit on a Color Basis

Adjust the toner concentration detection circuit on a color basis if any of the following conditions exists:

- The developing assembly has been replaced.

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- Any of the parts inside the developing assembly has been replaced.

1) Put starter developer into the developing assembly in question, and set the developing assembly into the copying machine.
2) Press the [*][4][*][*][1][3][0][*] [1][*] keys on the display PCB to stir the starter developer inside the developing assembly; the machine operates for about 3.5 minutes and stops automatically.
3) Select any of the following addresses in the switch mode ([*][4][*]) according to the developing assembly in question.

Developing assembly	Address
M	[*][1][3][1][*]
C	[*][1][3][2][*]
Y	[*][1][3][3][*]
BK	[*][1][3][4][*]

Table 3-17

4) Press the [1] and [*] keys, and turn the volume until the reading is 4.00 ±0.20 V for the developing assembly in question.

Developing assembly	VR
M	VR403
C	VR405
Y	VR401
BK	VR407

Table 3-18

5) Press the [0] and [*] keys after adjustment.
6) Select any of the following addresses corresponding to the developing assembly selected to register the value; the machine operates for about 3.5 min and stops automatically.

Developing assembly	Address
M	[*][1][3][6][*][1][*]
C	[*][1][3][7][*][1][*]
Y	[*][1][4][0][*][1][*]
BK	[*][1][4][1][*][1][*]

Table 3-19

7) Press the [C] key twice.
8) Press any of the following addresses corresponding to the developing assembly to check that the reading is 4.00 ±0.20 V.

Developing assembly	Service mode ([*][1][*])
M	[*][2][5][0][*]
C	[*][2][5][1][*]
Y	[*][2][5][2][*]
BK	[*][2][5][3][*]

Table 3-20

If any reading is not 4.00 ±0.20 V, perform step 3) and onward.

9) Select the following addresses, and record the readings on the label.

DATA	, ,	, ,	, ,	, ,
ADDRESS	INT			
L240				
L241				
L242				
L243				
L244				
L245				
L246				
L247				

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Table 3-21

Note:
The label is attached to the front cover of the hopper unit.

10) Press the [C] key twice.

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4. Adjusting Service Mode U103 and U104

If a line is noted across the copy (cross feed direction) during continuous copying, perform the following adjustments:

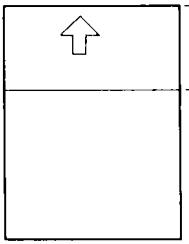

Figure 3-85

1) Enter U103 of the service mode; [*][3][*][*][1][0][3][*]
2) Press the [*], [+/-], [+/-] and [*] keys to increase the transfer condition by one step.

Notes:
1. **The transfer condition may be any of the five steps. Be sure to change it step-by-step; otherwise, faulty transfer may occur.**
2. **The current environment refers to the current environment measured by the current sensor.**

3) Make three or more copies, and check them for lines in the cross feed direction. If a line is noted, perform step 2) once again.
4) Select U104 and increase the step by one (0 through 4) if a white spot is noted around 50 mm from the trailing edge of the image even after the lines have been corrected by U103.
   [*][3][*][*][1][0][4][*]
   [*][+/-][+/-][*]

Note:
The adjustment for white spots (U104) is effective only when the adjustment value for U103 is any of the values in blue in the following table; otherwise, the value will be treated as '0' regardless of the reading for U104.

5) Make a copy, and check it for a cross feed line or white spot.

U103 No. / Environment	1	2	3	4	5	
I	11	*12	13	14	15	Large
II	21	*22	23	24	25	
III	31	*32	33	34	35	Transfer output
IV	41	*42	43	44	45	
V	51	*52	53	54	55	
VI	61	*62	63	64	65	
VII	71	72	*73	74	75	Small

Large ← Transfer output → Small

*Initial value.

Table 3-22 Range of settings (U103)

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5. Adjusting laser power

The laser power or laser itself need not be adjusted even after replacement of the laser unit (FG1-9720), scanner mirror motor unit (FG1-9723), laser scanner unit (FG1-9719), or DC controller PCB.

Take measurements of the laser power if the image proves to be faulty after replacement of any of the above; if the measurements appreciably differ from specifications, make the following adjustments:

a. Tools to Use
- Laser power checker (TKN-0481)
- Digital multi-meter (CK-0552)

b. Procedure
1) Turn the power switch on the printer unit OFF.
2) Open the upper cover, and remove the lid.
3) Remove the display cover, and insert the door switch actuator into the door switch unit.
4) Turn the power switch ON so that the machine will be in the standby mode.
5) Remove the top cover of the laser driver PCB.
6) Open the cover for the opening provided for the laser power checker.
7) Insert the laser power checker into the opening.
8) Connect the lead wire of the laser power checker to the digital multi-meter, and set the meter to the 200 mV DCV range.

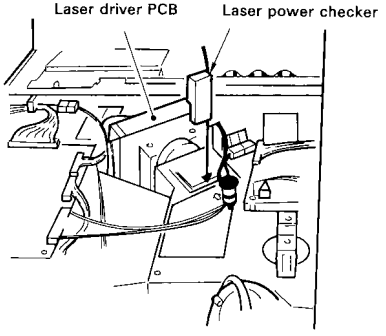

Figure 3-85a

9) Select "LASER ON 1" in the service mode to cause the laser to go ON; ✳ 4 ✳ ✳ 1 1 1 ✳ 1 ✳ .
10) Check that the reading on the digital multi-meter is within specification; if not, turn VR902 on the laser driver PCB to make adjustments. (62.5 ±2.0 mV, standard A)
11) Press 0 and ✳.
12) Press ✳ 1 1 2 ✳ 1 ✳ to cause the laser to go ON.
13) Check that the reading on the digital multi-meter is within specification; if not, turn VR903 on the laser driver PCB to make adjustments. (44.4 ±2.0 mV, standard B)
14) Press 0 and ✳, and press the C key twice.
15) Adjust the laser.
16) Turn the power switch OFF.
17) Detach the laser power checker and door switch actuator.
18) Install all covers.

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6. Adjusting the Laser

1) Turn the power switch of the printer unit OFF.
2) Open the upper cover, and remove the lid.
3) Remove the rear cover, and tape the microswitch in place.
4) Remove the display cover, and insert the door switch actuator into he door switch unit.
5) Turn the power switch ON so that the machine will be in the standby mode.
6) Remove the top cover of the DC controller PCB.
7) Turn SW101 and SW102 on the DC controller ON.
8) Remove the top cover of the laser driver PCB.
9) Loosen the screw on the cover at the opening for the laser power checker, and open the cover.
10) Insert the laser power checker into the opening.
11) Connect the lead wire of the laser power checker to the digital multi-meter, and set the meter to the 200 mV⎓ DCV range.
12) Release the cleaning unit.
13) Enter the following addresses for the service mode:
    No. 1 ✳4✳✳1130✳ or
    No. 2 ✳4✳✳1140✳
14) Press 1 and ✳ to cause the laser to go ON.
15) Turn SW100-1 on the DC controller PCB ON.
16) Turn SW100-2 on the DC controller PCB OFF.
17) Check if the reading on the digital multi-meter is within specification; if not, turn volume I (or VR907 or VR905) so that it is within spec A (0.5 ±0.1 mV)
18) Turn SW100-2 on the DC controller PCB ON.
19) Check if the reading on the digital multi-meter is within spec B (50.0 ±2.0 mV).
    If higher than spec B, turn volume II (VR906 or VR904) counterclockwise; if lower than spec B, turn volume II (VR906 or VR904) clockwise.
20) Turn SW100-2 on the DC controller PCB OFF, and check that the reading is within spec A (0.5 ±0.1 mV); if not, repeat step 17) and onward.
21) Turn the power switch OFF.
22) Turn SW100-1, SW100-2, SW101, and SW102 on the DC controller PCB all OFF.
23) Detach the laser power checker and door switch actuator.
24) Install all covers.

No.	DC controller		Service mode address Nos.	Volume		Spec (mV)	
	SW100-1	SW100-2		I	II		
1	ON	OFF	✳4✳	VR907	—	A	0.5±0.1
		ON	✳1130✳	—	VR906	B	50.0±2.0
2	ON	OFF	✳4✳	VR905	—	A	0.5±0.1
		ON	✳1140✳	—	VR904	B	50.0±2.0

Note:
The volumes on the laser driver PCB are arranged as shown below; take care so that the correct volumes are turned for adjustment.

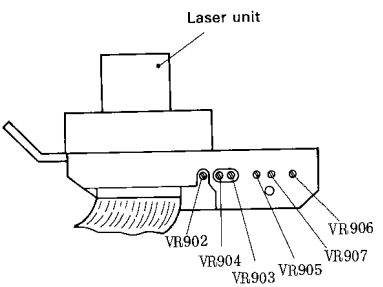

Figure 3-85b

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7. Adjusting the Auto Focus Mechanism

a. Adjusting the Focus

Adjust the focus when

- The laser unit has been replaced;
- The laser/scanner unit has been replaced;
- The correction lens has been replaced; or
- The AF fiber has been replaced.

1) Enter the service mode (✳4✳), and select the focus adjustment test print; choose one from the following three.
   - ✳2501✳1✳ (light)
   - ✳2511✳1✳ (medium)
   - ✳2521✳1✳ (dark)
2) Set the A3/Ledger cassette in the upper cassette holder.
3) Press the TEST PRINT key for a printout.
4) Check the test print, and decide the difference between the best focus registered and that of the test print.

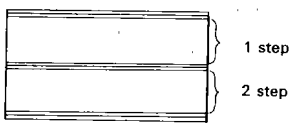

Figure 3-86

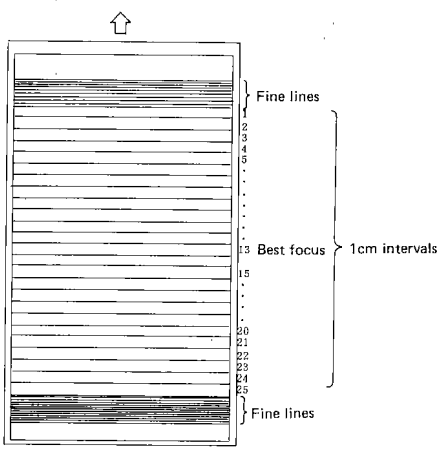

Figure 3-86a

Note:
The test print carries lines in 25 steps produced by changing the position of the lens.

The best focus is the lightest step when viewed from the side.

The best focus registered in U143 is the 13th step from the top.

5) If the best focus is not on '13th line ±1', enter the difference in the AF position input mode (U162).

EX. If the best focus is on the 15th line when checked by the eye, 15 – 13 = 2; as such, enter '2' in U162.

6) Make a test print once again, and check the best focus position; if it is not '13th line ±1', adjust it again.
7) Select U143 in the service mode, and record the value on the label.
8) Adjust the AF fiber position.

b. Adjusting the AF Fiber

1) Enter the service mode, and select the AF check mode (✳4✳✳2 43✳1✳).
2) Check the value indicated on the display PCB; normal if between +2 and – 2. If not normal, go to step 3).
3) Turn the adjusting screw of the AF fiber unit with reference to the value checked in step 2).
   Turn the adjusting screw 1/3 for each '1' on the display; '3' calls for a full turn.
   Turn it clockwise if the indication is a positive value and counterclockwise if otherwise.
4) Go to step 1).

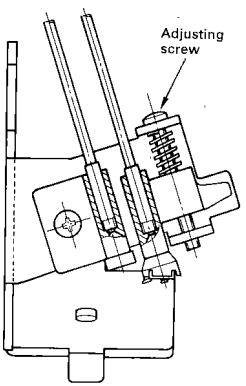

Figure 3-86b

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G. Test Print

1. Horizontal-stripe test print

Make horizontal-stripe test prints and check the dark-area density of each color and the balance between colors, and check for white stripes in the color areas.

a. Dark-area density of color and balance between colors
   All colors on the horizontal-stripe test print should be reproduced at maximum density. The test print should not have areas of very low density.
   If the image density of only one color is low, the developing unit for that color may be faulty.
   If the image density of all colors is low, the laser system may be faulty.
b. White strips in areas of one color only
   If white stripes appear, only in cyan images, for example, the cyan developing unit may be faulty.
c. Difference in density between right and left areas
   When a difference in density between right and left areas is observed in all colors, the height of the primary or transfer corona wire may be incorrect.
d. Horizontal image position
   If the cassette holder is positioned incorrectly, the horizontal position of the image on the copy becomes incorrect, resulting in an image too far to one side. This may cause toner to scatter and soil the inside of the machine.

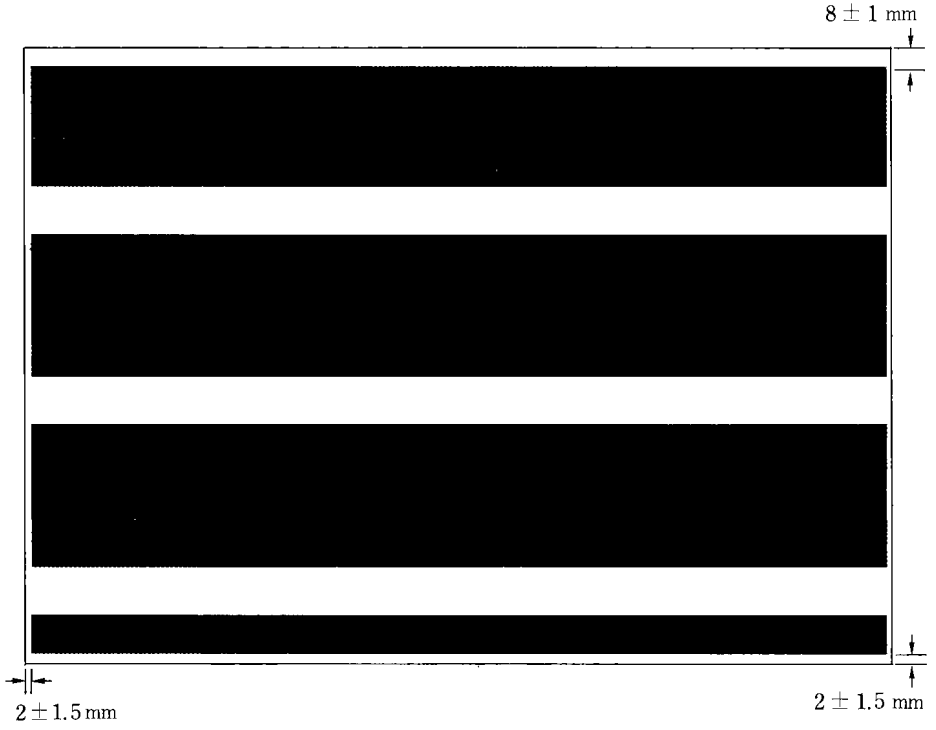

Figure 3-87

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2. 16-gradation test print

Make a 16-gradation test print and check for tone reproduction, fogging, white strips, and difference in density between right and left areas.

a. Tone reproduction
If the density gradations shown in Figure 3-88 are not distinct, the laser system may be defective.

b. Fogging
The white area should not be fogged.

c. White stripe
If white strips appear on the image, the developing system is likely to be defective.

d. Difference in density between right and left areas
If the image density differs between right and left areas, the primary corona or transfer corona wire may be at an incorrect height.

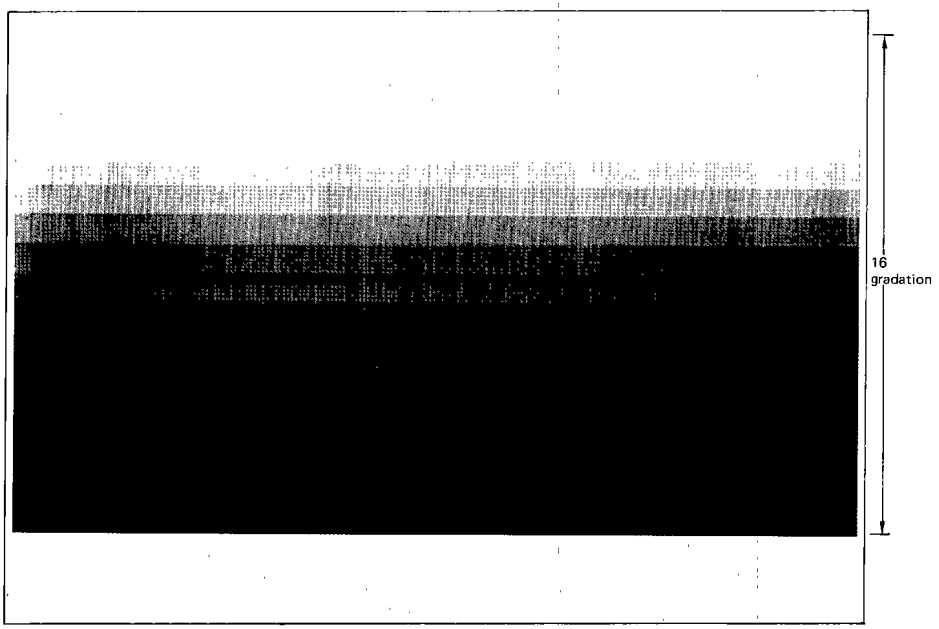

Figure 3-88

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3. Halftone test print

Make a halftone test print and check for blank areas.

a. Blank areas
If there are blank areas, the transfer drum sheet or the static charge eliminating corona unit may be defective (poor transfer).

b. Black strips
If black strips appear, the photosensitive drum may be scratched or the primary corona wire may be dirty.

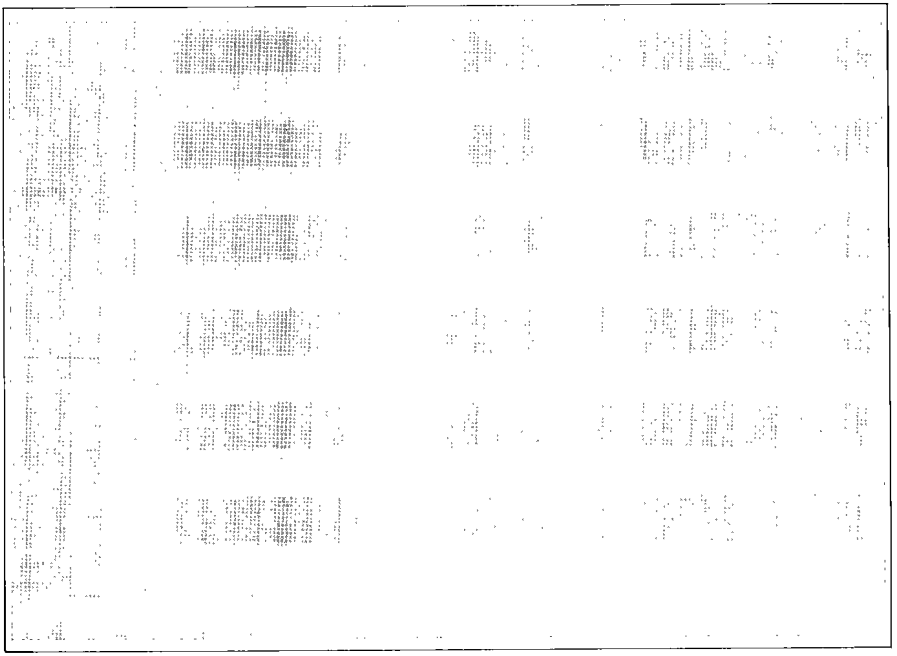

Figure 3-89

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4. 64-color test print

Make a 64-color test print and check for color reproduction and fogging.
All 64 colors should be reproduced in the first four lines from the leading edge of the copy, and they should repeat regularly every four lines.

a. Reproduction of 64 colors
   Colors should be reproduced as shown in Figure 3-90. If colors are different, the developer or the photosensitive drum may have deteriorated, or developer of different colors may be mixed.

b. Fogging
   If only the white areas shown in Figure 3-90 are fogged, the laser may be adjusted incorrectly.
   If the entire copy is fogged, the developing system or the photosensitive drum may be faulty.

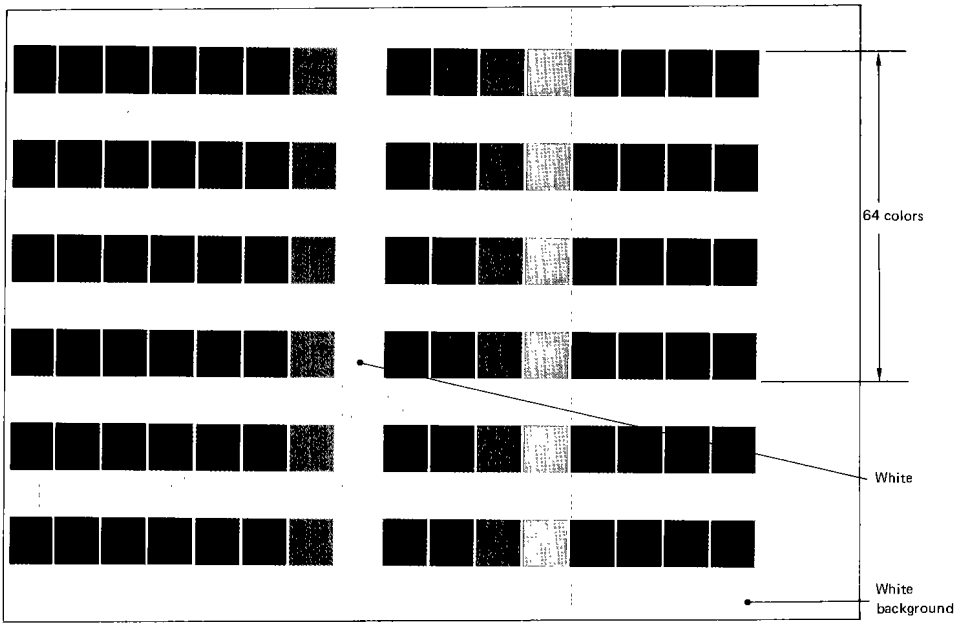

Figure 3-90

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5. Test Print of Gray Scale

With the gray scale test print, the prints may be checked to see if the four colors (developers) are uniformly mixed.

a. Balance Between Colors
The output of each color in the gray scale test print should be the same in density; otherwise, adjust the contrast potential.

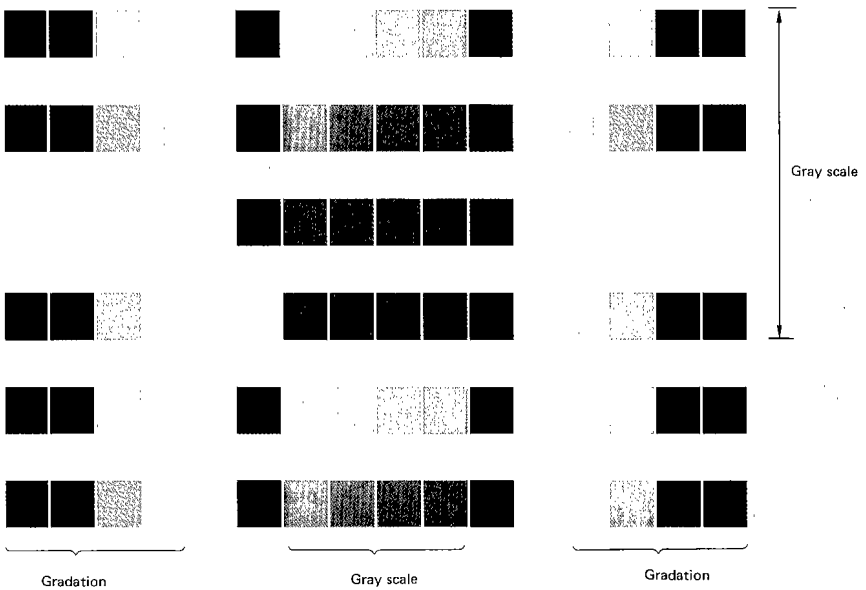

Figure 3-91

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H. STANDARD IMAGE

Make full-color (four-color) copies with the CANON CA-1 test sheet. Standard-image copies should satisfy the following conditions of the gray scale, color patches, and three-color gradation scale (which are on the test sheet).

1. Gray scale

No. 1 (dark area) should be almost completely solid. The image should become lighter as the scale numbers increase. No. 8 of the light area should be barely visible. No. 9 should be blank.
Halftones should be almost gray, not yellow, red, or blue.

2. Color patches

Colors should be distinguishable from each other. Colors on the copy should not be much different from those on the test sheet.

3. Photograph

The color balance on the copy should not be much different from that on the original photograph.

4. Three-color gradation scale

All three colors should be close to the primary colors. The image density should decrease as the scale numbers increase. No. 8 should be barely visible, and No. 9 should be blank.

5. Halftone stripe

Colors of the stripe on the copy should not be much different from those on the test sheet. The image should be even along the entire length of the stripe. Colors near the right and left edges should not differ very much.

6. Fogging

The white area of the test sheet should not be fogged.

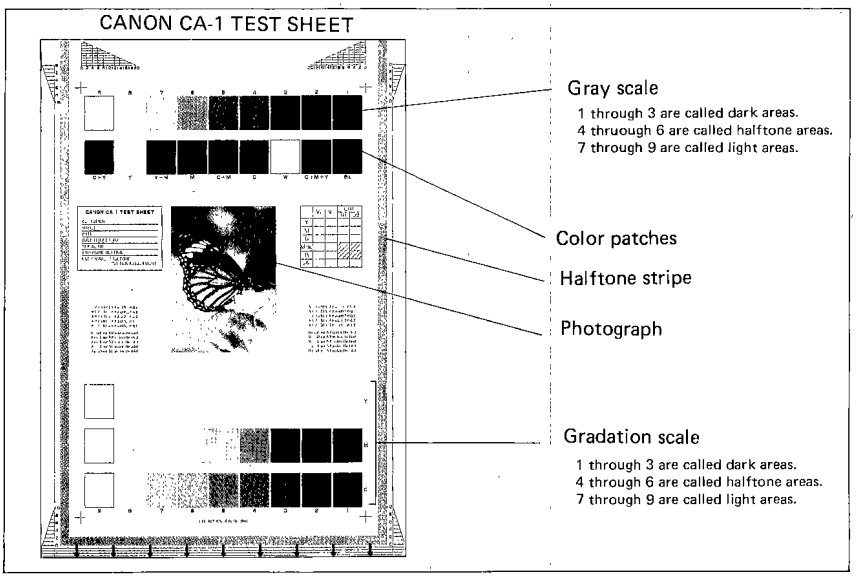
CANON CA-1 TEST SHEET
Gray scale
1 through 3 are called dark areas.
4 thruough 6 are called halftone areas.
7 through 9 are called light areas.
Color patches
Halftone stripe
Photograph
Gradation scale
1 through 3 are called dark areas.
4 through 6 are called halftone areas.
7 through 9 are called light areas.

Figure 3-92

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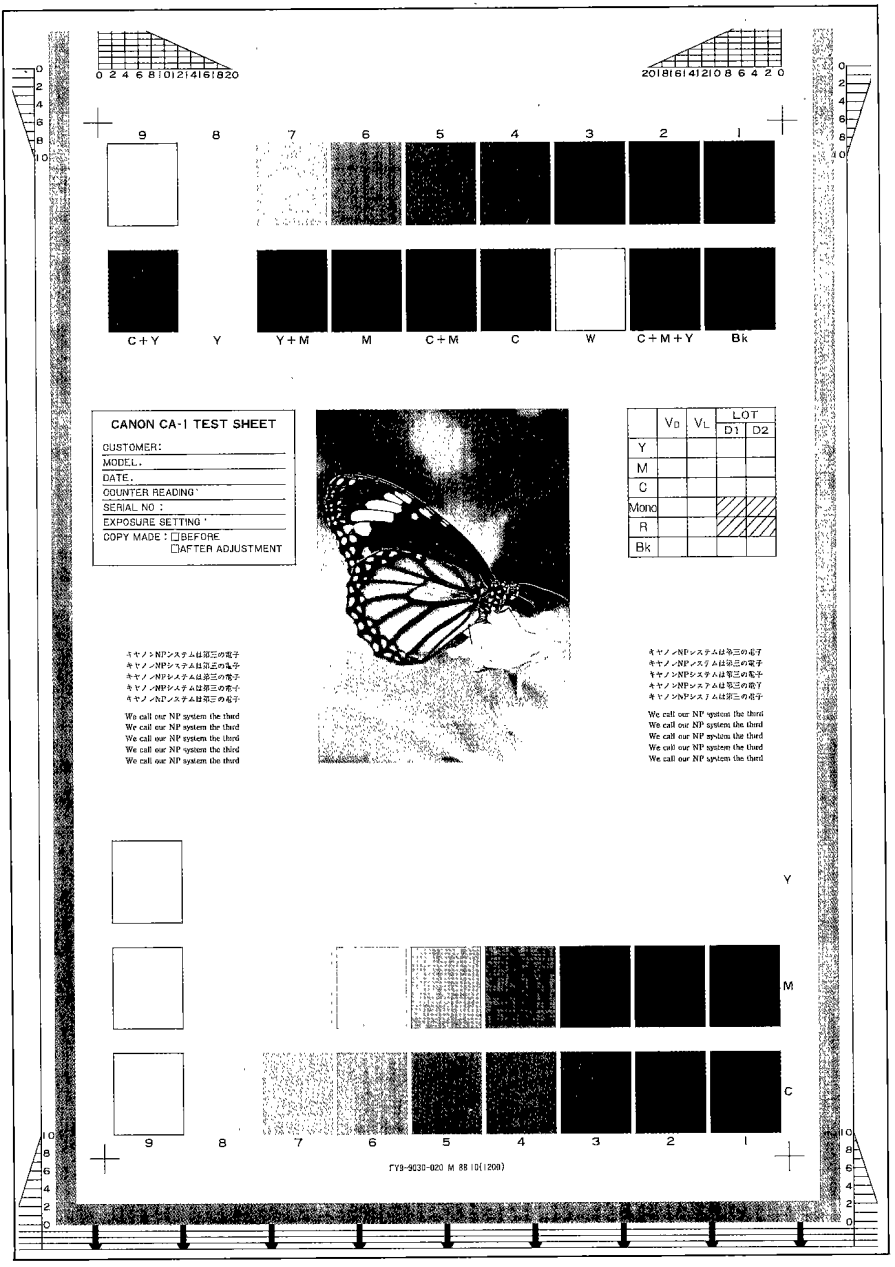

Figure 3-93 Standard Image Sample

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VIII. SELF-DIAGNOSIS

A. Self-diagnosis Indications

The COLOR LASER COPIER has a self-diagnosis feature based on sensors, the CPU PCB, and the microcomputer of the DC controller PCB. If the self-diagnosis system detects an abnormality, the appropriate error code is displayed on the touch-panel display of the control panel and on the display PCB.

The table below lists the error codes, causes, and timing of tests.

Error code	Major causes	Condition(s) identifying problem	
E000	• Thermistor (TH1) open circuit or poor contact. • Broken fixing roller heater (H1, H2). • Defective AC driver PCB. • Defective DC controller PCB. • Defective triac.	L366L 004	The connector of the thermistor is disconnected.
		005	The temperature of the fixing roller has exceeded 200°C.
		006	The temperature of the fixing roller fails to reach 50°C within 2 min after the power switch is turned ON.
E005	• Cleaning belt of fixing unit nearly used. • Defective remaining cleaning belt sensor (Q25). • Defective DC controller PCB.	• The thickness of the fixing unit cleaning belt on the take-up reel exceeds the allowable limit.	
E010	• Defective drum motor. • Defective motor driver PCB. • Defective DC controller PCB.	• Clock pulses are not being generated within 0.2 second after the drum motor starts rotating and the first TRANSFER DRUM HOME POSITION SENSOR signal is output. • The specified number of clock pulses is not output for one rotation of the transfer drum.	
E012	• Faulty main motor. • Defective DC driver PCB. • Defective DC controller PCB.	• The speed of the main motor was not of the specified range for 2 seconds or more.	

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Error code	Major causes		Condition(s) identifying problem	
E020	Low intensity because of defective toner concentration detection lamp or filter optical fiber	L330 (M)	001	Reading for address L260, L261, L262 or L263 is lower than required (about 0.3).
	Low intensity because of defective toner concentration detection lamp or filter	L331 (C)	002	Reading for address L260, L261, L262, L263 is higher than required (about 3.5).
	Defective filter switching solenoid	L332 (Y) L333 (BK)	003	Reading for addresses L260 and L264, L261 and L265, L262 and L266, or L263 and L267 were indentical four times or more in succession.
	Defective toner concentration detection lamp or optical fiber		004	Reading for address L260 is less than half that for L244 (likewise for L261/L245, L262/L246, L263/L247).
	Inadequate M toner supply because of excessive M development		005	Toner concentration does not reach the required value even after 20 or more toner-replenishing rotations of the transfer drum. (A4, 3-color)
	Damaged toner supply screw or toner supply clutch		006	Reading for address L254 is less than that for L240 (likewise for L255/L241, L256/242, L257/L243) for move than 30 copies in succession.
	Defective toner concentration filter or optical fiber		008	The difference between the highest and lowest measurements obtained by P135 (service mode) during density adjustment is about 0.3 V or more.

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Error code	Major causes	Condition(s) identifying problem	
E021	• Defective turret motor (M4). • Defective turret motor controller PCB. • Defective turret motor driver PCB. • Defective transistor unit. • Defective DC controller PCB. • Over-load on main motor.	L335 001	The turret lock release sensor (Q12) fails to detect lock release.
		002	The PEND signal fails to go '1' (The turret operation end signal is not generated.)
		003	The PEND signal fails to go '0'. (The turret operation end signal persists.)
		004	The turret lock release sensor (Q12) fails to detect locking.
		005	The turret home position signal is not generated within 20 sec.
		006	The END signal fails to go '0'. (The turret operation end signal is not generated.)
		008	An over-current is detected.
E030	• Discontinuity in coil circuit of counter. • Defective DC controller PCB. • Defective DC driver PCB.	• Counter does not operate when it should.	
E040	• Defective cassette paper lifter clutch. • Defective DC driver PCB. • Defective DC controller PCB.	• CASSETTE LIFTER POSITION SENSOR signal is not generated within 10 sec after the CASSETTE PAPER LIFTER CLUTCH DRIVE command was output.	

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Error code	Major causes	Condition(s) identifying problem	
E061	• Defective drum surface potential measuring unit. • Defective drum surface potential controller PCB. • Defective primary corona unit. • Defective HVT-DC2. • Defective HVT-DC4. • Defective DC controller PCB. • Defective environment measuring PCB. • Defective laser unit. • Defective pre-exposure lamp.	L334 001	The difference between V_{D1} and V_{D2} is 50 V or less.
		002	The values of V_{D1} and V_{D2} or V_{L1} and V_{L2} are approximates.
		003	The values of V_{D2} and V_{D3} or V_{L2} and V_{L3} are approximates.
		007	The upper limiter of the grid bias is activated.
		008	The upper limiter of the developing bias is activated.
		009	The values of V_{D1}, V_{D2}, and V_{D3} are all 20 V or less. (mainly, primary corona output failure)
		010	The value of V_{D1} is 600 V or more; or the difference between V_{D1} and V_{D2} is 70 V or less. (mainly pre-exposure lamp failure)
		011	The values of V_{D1}, V_{D2}, and V_{D3} are all 100 V or less. (mainly, grid bias output failure)
		012	The values of V_{D1}, V_{D2}, and V_{D3} are all 900 V or more. (mainly, broken grid wire)
		013	The difference between V_{D1} and V_{L1}, between V_{D2} and V_{L2}, or V_{D3} and V_{L3} is 100 V or less. (mainly, laser beam insufficiency)
E070	• Defective drum motor • Defective motor driver PCB • Defective drum home position sensor (Q16) • Defective DC controller PCB • Defective transfer drum	• The transfer drum home position detect signal is not generated within 6 sec after the drum motor starts to rotate. • The intervals of the transfer drum home position detect signal while the drum motor rotates are 6 sec or more.	
E071	• Defective image leading edge sensor (Q15) • Defective DC controller PCB	• The image leading edge detect signal is not generated while the drum motor rotates between two transfer drum home position detect signals.	

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Error code	Major causes	Condition(s) identifying problem	
E072	• Defective gripper motor. • Defective separation motor • Defective paper guide motor • Defective push-up sheet position sensor • Defective separation claw home position sensor • Defective paper guide home position sensor • Defective transfer driver PCB • Defective DC controller PCB	L337 001	The push-up sheet position signal fails to go from '0', to '1', and then to '0' at power-on.
		002	The separation claw home position signal fails to go '1' at power-on.
		003	The paper guide home position signal fails to go '1' at power-on.
E100	• Wrong laser folding mirror position • Defective laser unit • Defective optical fiber • Defective DC controller PB	• The BD signal cycles have a discrepancy of 2 sec or more.	
E101	• Defective AF sensor PCB • Defective AF motor • Defective transfer driver PCB • Defective transfer driver PCB • Defective DC controller PCB	L340 001	The correction lens home position fails to go '1' at power-on.
		002	The timing signal (AFT) for AF data transmission is not received in AF mode.
E110	• Defective laser scanner motor • Defective laser scanner motor driver PCB • Defective DC controller	• The laser scanner motor fails to reach the specified speed within 60 sec after power-on.	
E120	• Defective laser unit. • Defective DC driver PCB. • Defective DC controller PCB.	• Laser unit has not reached the specified temperature within 60 seconds after the power is switched ON.	
E205	• Defective scanner motor. • Defective scanner travel limit sensor (left or right). • Defective scanner motor controller PCB. • Defective CPU PCB. • Defective power supply to the scanner motor controller PCB.	• The scanner is not at its HOME position within 6 seconds after the power is switched ON and the CPU outputs the return to HOME POSITION command. • The scanner travel limit sensor (left or right) detects the scanner at the following times: 1. In STANDBY, 2. When signal PSYNC is received from the printer, 3. After a scanning operation during copying. • There is a communication error between the CPU PCB and the scanner motor controller PCB.	

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Error code	Major causes	Condition(s) identifying problem
E302	• Defective scanning lamp • Defective standard white sheet • Defective CCD • Defective CCD pre-amplifier PCB • Defective CCD driver PCB • Defective analog processor PCB • Defective digital processor PCB • Defective wiring	• The density level is smaller (darker) than the standard value when measuring the standard white sheet after the COPY START key is pressed. If SERVICE mode has been selected even once after scanner power is turned ON, E302 will not be detected from that time onward.
E350	• Bar code label (faulty or not attached) • Digital processor PCB (faulty) • CPU PCB (faulty) • ECO processor PCB (faulty)	• The bar code label is not detected during the first copying operation after power-on.
E351	• Digital processor PCB (faulty) • ECO processor PCB (faulty) • CPU PCB (faulty)	• The ECO processor PCB and the digital processor PCB are not connected. • The ROM on the ECO processor PCB is not of a correct type.
E352	• Bar code label (faulty or not attached) • Digital processor PCB (faulty) • CPU PCB (faulty) • ECO processor PCB (faulty)	• The bar code cannot be read when 'DOC VB-LEV' is executed in service mode.
E353	• White density calibration plate (faulty) • Blank paper (faulty)	• Damage or dirt is found on the white density calibration plate when 'DOC B-LEV' is executed in service mode. • The density of the blank paper set on the copyboard is too high when executing 'DOC B-LEV' is executed in service mode.
E620	• Defective editor controller PCB • Defective CPU PCB	• A communication error between the CPU PCB and the editor controller PCB has occurred.
E633	• Film projector controller PCB (failure) • CPU PCB (failure)	• The communication between the film projector and CPU PCB fails for 5 sec or more.
E634	• Projector lamp (failure)	• See the PROJECTOR SERVICE MANUAL.
E640 (See the IPU MANUAL.)	• IPU 30D • CPU PCB	• A communication error exists between the CPU PCB and IPU. • A problem exists in the IPU. • See Reference.
E650 (See the FILM SCANNER MANUAL.)	• Defective film scanner • Defective CPU PCB	• A communication error between the CPU PCB and film scanner. • A problem inside the film scanner.
E700	• Defective printer DC controller PCB • Defective CPU PCB	• A communication error between the CPU PCB and the DC controller PCB has occurred.

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Reference:

1. When an error is detected by the self-diagnosis system, the machine can be reset by setting the power switch OFF briefly, then ON again, except when E000 is displayed to indicate a broken thermistor. (This prevents the user from damaging the fixing roller by restarting the machine and causing the roller to overheat.)

   E000 is reset using the printer SERVICE mode, as follows:

   1) Set the SERVICE mode and enter [*] [4] [*] [*] [2] [0] [0] [*] on the printer display PCB.
   2) Press [1] [*]. (This cancels E000.)
   3) Press the [C] key twice.
   4) Set the power switch OFF then ON.

2. The copying machine checks the type of option connected to it at power-on. Should a communication problem occur and detection of the option fail, 'E640' is indicated.
3. The machine is not equipped with a mechanism to check the IC card unit for problems; as such, the message 'CARD NOT ACCEPTED' is displayed in response to any problem in the IC card or the IC card unit alike.

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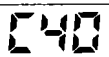
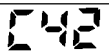
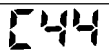
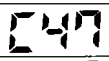
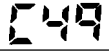
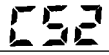
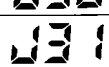
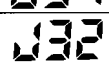
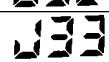
B. Printer Warning Indications

The CPU PCB and the DC controller microprocessor of the printer have error detection functions, especially to determine whether the sensors are effective. As soon as an abnormal condition is found, an error code is displayed by the LED indicators on the display PCB.

Remarks:
If the document scanner and printer are connected, these error codes are transmitted to the document scanner and displayed on the control panel LCD display, but they are not displayed if the printer and document scanner are disconnected and printer operation is checked; the LED indicators on the display PCB of the printer show any error codes.

The error codes are also displayed on the 7-segment displays on the display PCB.

Code	Reason for indication	Remarks
	No copy paper or no cassette	
	Waste toner above specified level	
	Door is open	
	Warm-up	
	No silicone oil for fixing assembly	
	No control key	
	No magenta toner	
	No cyan toner	
	No yellow toner	
	No black toner	
	Wrong print	
	Warns of an error that occurs during copy operation; the applicable code will be indicated when the copy operation is complete.	
	Paper jam in upper cassette	
	Paper jam in lower cassette	
	Registration roller paper jam	
	Transfer drum paper jam	

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Code	Reason for indication	Remarks
J34	Separation unit paper jam	
J35	Delivery unit delay jam	
J36	Delivery unit stationary jam	

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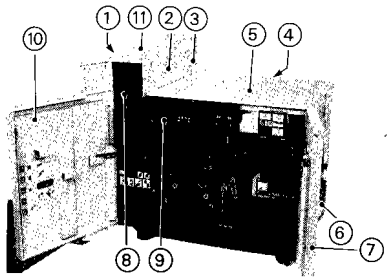
I. EXTERNALS

A. Covers and Panels



① Left panel (4)
② Hopper right panel (2)
③ Hopper rear panel (3)
④ Rear panel (4)
⑤ Top cover (6)
⑥ Right panel (4)
⑦ Front left door (3)
⑧ Hopper front cover (4)
⑨ Inner front cover (3)
⑩ Front left door (4)
⑪ Hopper top cover (3)

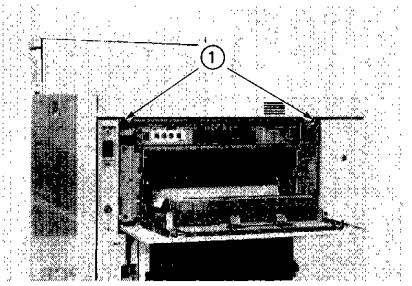
Figure 4-100

Note:
Numbers in parentheses refer to the number of mounting screws.

When cleaning, checking and repairing the device, follow the procedure described, and remove only the necessary parts. (Details of simple procedures are omitted.)

1. Top Cover

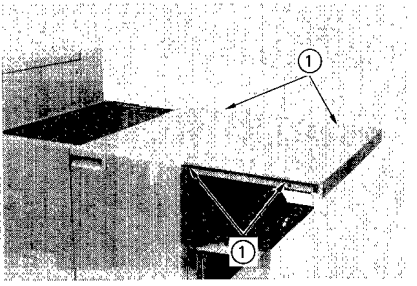
1) Remove the image scanner unit.
2) Open the delivery unit.
3) Remove the two mounting screws, and move the top cover to the right.



① Mounting screws

Figure 4-101

4) Remove the four screws, then the top cover.



① Mounting screws

Figure 4-102

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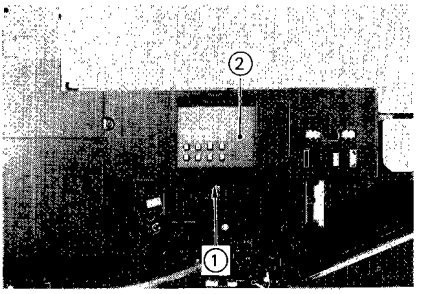
2. Inner Front Cover

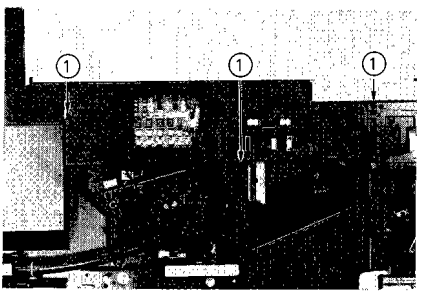
1) Remove the mounting screw then the display PCB cover.



① Mounting screw ② Display PCB cover

Figure 4-103

2) Open the silicone oil bottle unit to the front.
3) Remove the three mounting screws then the inner front cover.



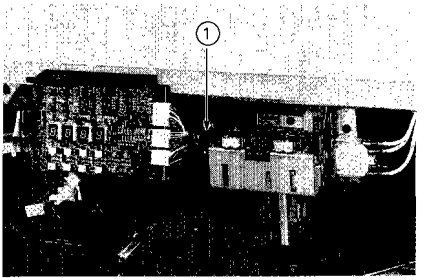
① Mounting screws

Figure 4-104

B. Door Switch Unit

1. Removing the Door Switch Unit

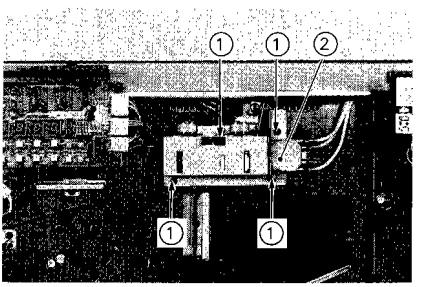
1) Remove the inner front cover.
2) Remove the laser shutter cable.



① Cable

Figure 4-105

3) Remove the mounting screw then the AC door switch.
4) Remove the three mounting screws then the door switch unit.



① Mounting screws ② AC door switch

Figure 4-106

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C. Fans

1. General

The following seven fans circulate air within the machine to prevent overheating.

Primary corona fan (M5): Supplies air to the primary corona area.

Feeder fan (M7): Holds copy paper onto the feeder belts.

Exhaust fan (M8): Removes hot air from the machine.

Toner dust collector motor 1 (M9): Collects toner around the photosensitive drum.

Toner dust collector motor 2 (M10): Collects toner from the transfer drum unit.

Inner exhaust fan (M14): Removes ozone from the machine.

Fixing assembly upper fan (M16): Removes hot air from the machine.

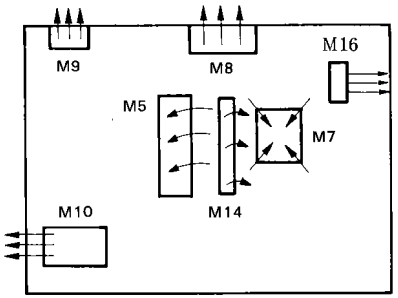
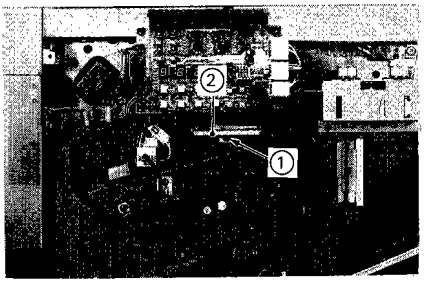


Figure 4-107

2. Primary Corona Fan (M5)

a. Removing the Filter

1) Remove the inner front cover.
2) Remove the mounting screw and pull the filter toward the front.

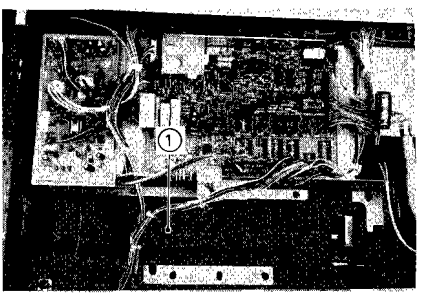


① Mounting screw ② Filter

Figure 4-108

b. Removing the Primary Corona Fan

1) Remove the filter.
2) Move the top cover to the right.
3) Remove the laser unit.
4) Remove the duct.



① Duct

Figure 4-109

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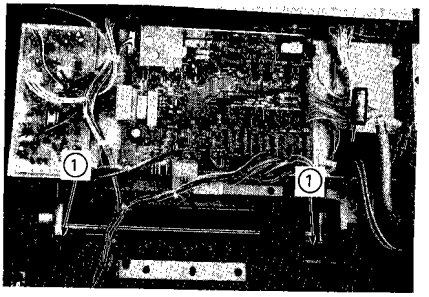
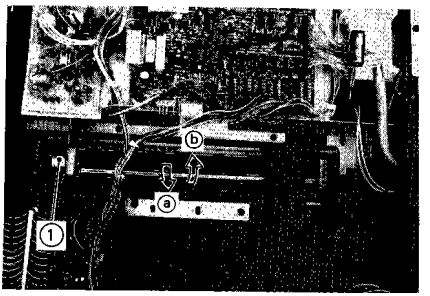
5) Remove the two mounting screws.



① Screws

Figure 4-110

6) Move the primary corona fan as shown. Rotate the fan 90° counterclockwise and remove it.



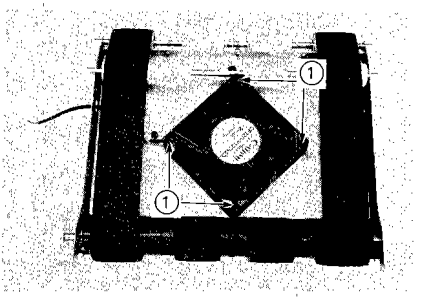
① Primary corona fan

Figure 4-111

7) Pull out the connector of the primary corona fan.

3. Feeder Fan (M7)

a. Removing the Feeder Fan
1) Remove the feeder from the machine.
2) Remove the two belts from the feeder.
3) Remove the four mounting screws then the feeder fan.

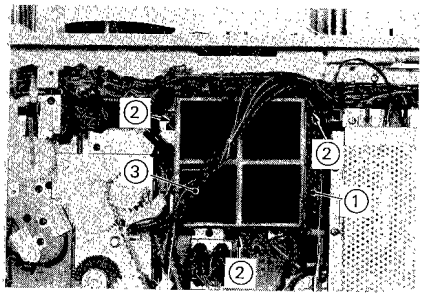


① Screws

Figure 4-112

4. Exhaust Fan (M8)

a. Removing the Exhaust Fan
1) Move the harness out of the way.
2) Disconnect the connector.
3) Remove the three mounting screws then the exhaust fan unit.



① Connector
② Mounting screws
③ Harness

Figure 4-113

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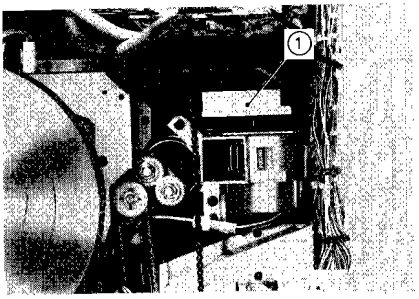
5. Toner Dust Collecting Motor 1 (M9)

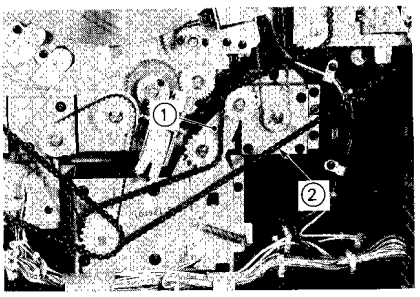
a. Removing the Filter
1) Raise the DC controller PCB.
2) Pull out the filter.



① Filter

Figure 4-114

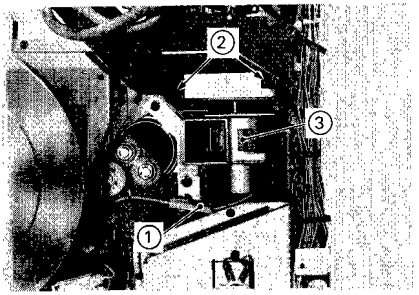
b. Removing Toner Dust Collecting Motor 1
1) Raise the DC controller PC board.
2) Open the power supply unit.
3) Move the tension sprocket spindle plate of the chain, and remove the chain.



① Tension sprocket spindle plate ② Chain

Figure 4-115

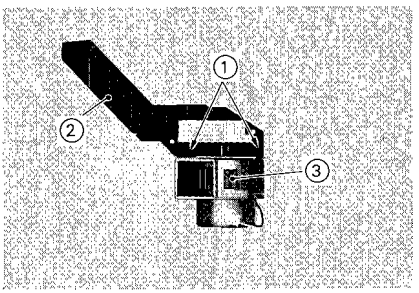
4) Disconnect the connector.
5) Remove the two mounting screws then toner dust collecting motor 1.



① Connector
② Mounting screws
③ Toner dust collecting motor 1

Figure 4-116

6) Remove the two mounting screws then the duct.
7) Remove the three mounting screws then the motor.



① Mounting screws ③ Motor
② Duct

Figure 4-117

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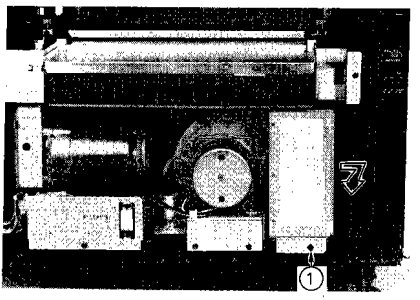
6. Toner Dust Collecting Motor 2 (M10)

a. Removing the Filter

1) Remove the mounting screw.
2) Move the filter to the right, then pull it out.

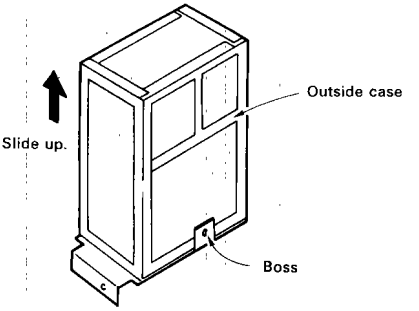


① Mounting screw

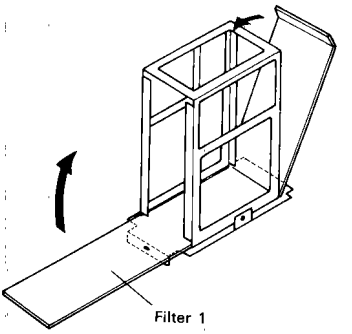
Figure 4-118

b. Mounting the Filter

1) Pry at the two bosses with a flat-blade screwdriver, and slide up and off the outside case.



2)



3).

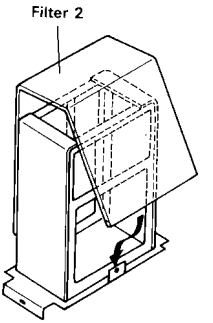


Figure 4-119

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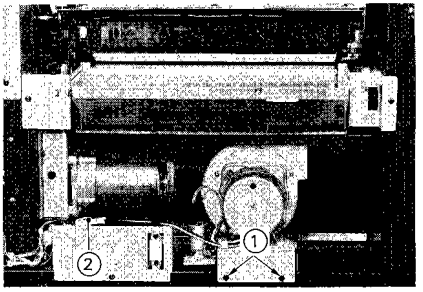
c. Removing Toner Dust Collecting Motor 2
1) Remove the filter.
2) Disconnect the connector.
3) Remove the two mounting screws then the motor.

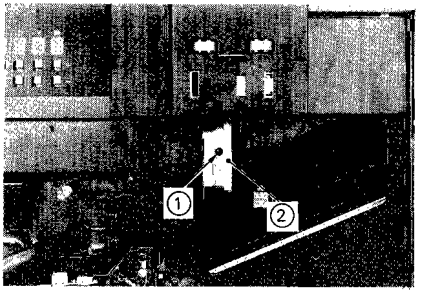


① Mounting screws ② Connector

Figure 4-120

7. Inner Exhaust Fan

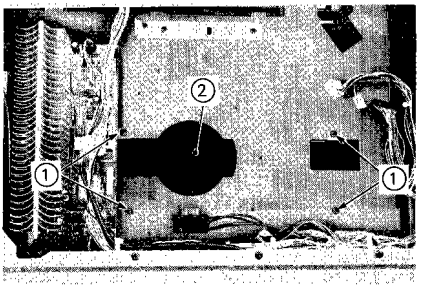
a. Removing the Filter
1) Remove the mounting screw, and pull the filter out.



① Mounting screw ② Filter

Figure 4-121

b. Removing the Inner Exhaust Fan
1) Remove the transfer drum unit.
2) Remove the laser unit and potential control PCB.
3) Remove the four mounting screws, and remove the duct.



① Mounting screws ② Duct

Figure 4-122

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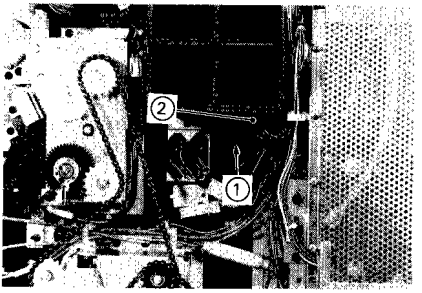
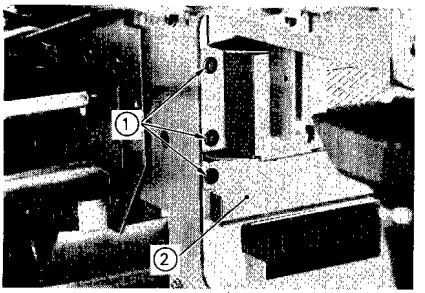
4) Remove the filter.
5) Remove the mounting screw and the connector.



① Mounting screw ② Connector

Figure 4-123

6) Remove the mounting screw then the fan support plate.
7) Remove the two mounting screws then the fan.



① Mounting screws ② Fan support plate

Figure 4-124

8. Developing Duct

a. Cleaning the Developing Duct

Clean the duct when replacing the photosensitive drum.

1) Remove the photosensitive drum.
2) Remove one developing assembly.
3) Turn the turret 180 deg., and orient the space vacated by the removed developing assembly toward the photosensitive drum.
4) Place paper under the developing duct.
5) Wipe off the toner that has accumulated on the center plate and behind the developing duct using lint-free paper; take care not to trap or peel the protection rubber found on the edge of the center plate.

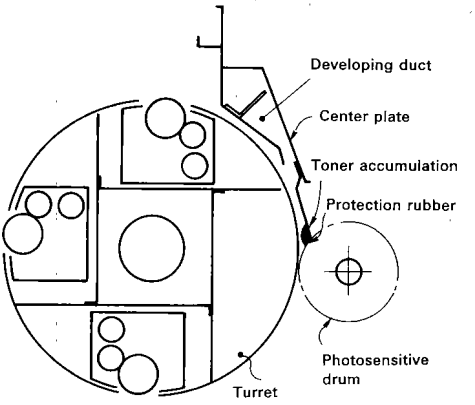


Figure 4-125

Note:
Wipe off the toner accumulations on a periodical basis; if left unattended, its contact with the developing cylinder or photosensitive drum can lead to mixing of colors.

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II. DRIVE SYSTEM

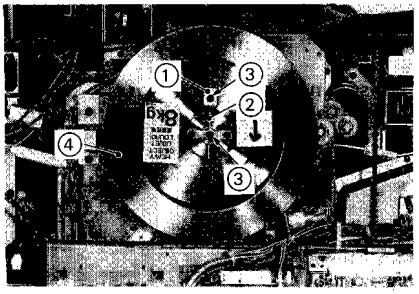
A. Drum Motor Unit

Note:
Disconnect the power plug before work.

1. Removing the Drum Motor

1) Raise the DC controller PCB.
2) Remove the mounting screw, and remove the pin mount and pin.
3) Remove the mounting screw then the flywheel.

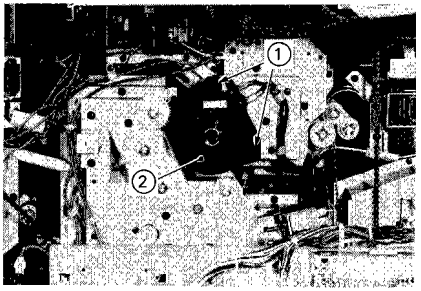
Note:
Do not drop the flywheel; it weighs about 8 kg.



① Pin mount ③ Mounting screw
② Pin ④ Flywheel

Figure 4-200

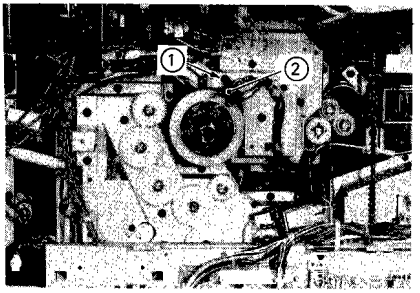
4) Remove the two mounting screws then the gear cover.



① Mounting screws ② Gear cover

Figure 4-201

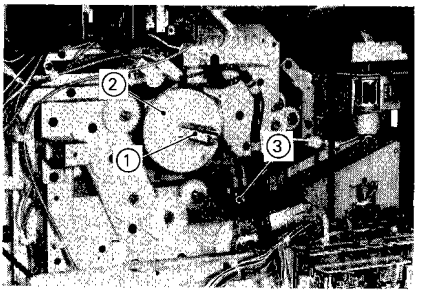
5) Remove the mounting screw then the brush unit.



① Mounting screw ② Brush unit

Figure 4-202

6) Remove the drum heater and drum drive gear.



① Drum heater ③ Brush-unit connector
② Drum drive gear

Figure 4-203

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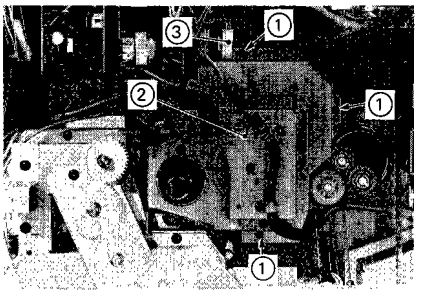
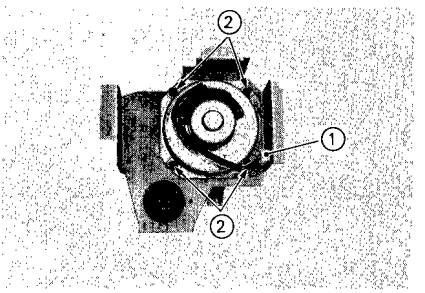
7) Disconnect the connector.
8) Remove the three mounting screws then the drum motor unit.



① Mounting screws ③ Connector
② Drum motor unit

Figure 4-204

9) Remove the connector from the motor mounting plate.
10) Remove the four mounting screws then the drum motor.



① Connector ② Mounting screws

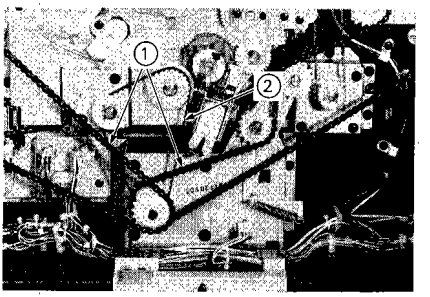
Figure 4-205

- The procedure to reassemble the drum motor unit is the opposite of the procedure used to dismantle it. However, note the following points:
- To mount the drum heater, assemble the drum heater, drum drive gear, and brush-unit connector, then insert them on the drum shaft. Be sure not to damage the heater cord.

B. Main Motor Unit

1. Removing the Main Motor Unit

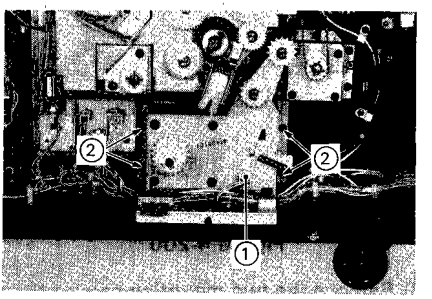
1) Raise the DC controller PCB.
2) Open the PCB unit.
3) Move the arm, and remove the two chains and belt.



① Chains ② Belt

Figure 4-206

4) Disconnect the connector.
5) Remove the four mounting screws then the main motor unit.



① Connector ② Mounting screws

Figure 4-207

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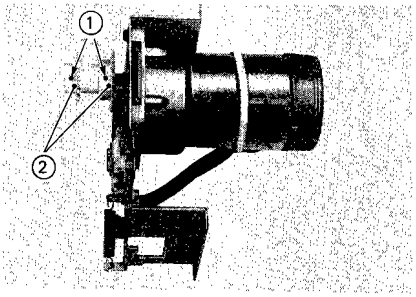
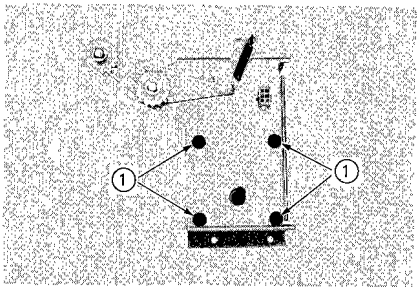
6) Remove the two setscrews, then the two sprockets and pulley.



① Setscrews ② Sprockets

Figure 4-208

7) Remove the four mounting screws then the main motor.



① Mounting screws

Figure 4-209

2. Sprocket Mounting Position

Mount the sprockets as shown in the figure below.

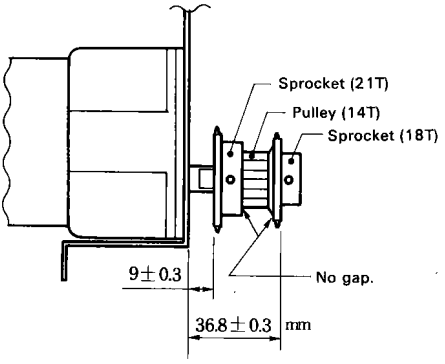


Figure 4-210

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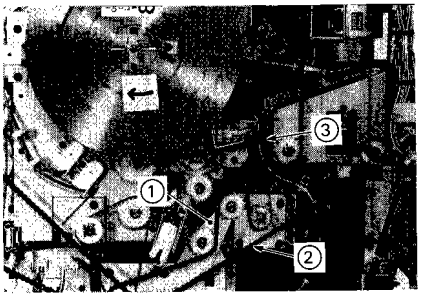
C. Developing Unit Drive Motor Unit

1. Removing the Developing Unit Drive Motor Unit

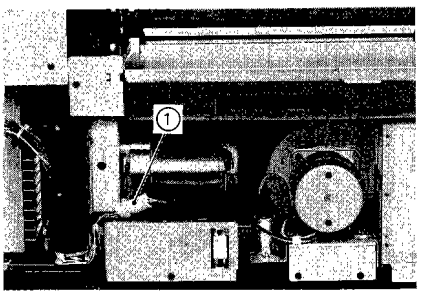
1) Move the arm, and remove the chain.
2) Remove the drive belt.



① Arm
② Chain
③ Drive belt

Figure 4-211

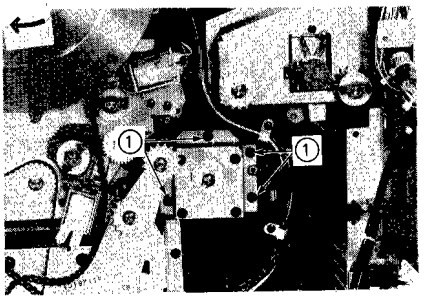
3) Disconnect the connector (6P) under the roller.



① Connector

Figure 4-212

4) Remove the four mounting screws then the developing unit drive motor unit.



① Mounting screws

Figure 4-213

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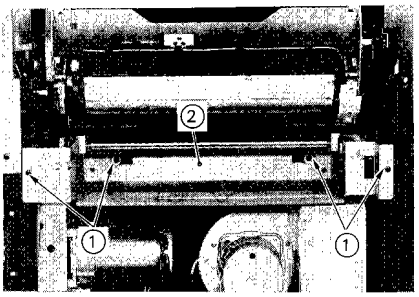
D. Turret Motor Unit

1. Removing the Turret Motor

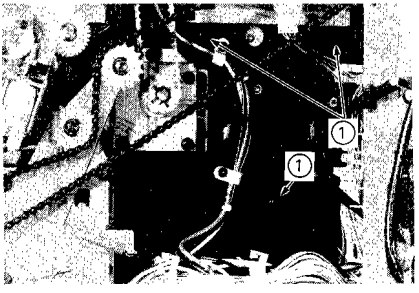
1) Remove the developer collector.
2) Remove the four mounting screws then the developer collector unit.



① Mounting screws ② Developer collector unit

Figure 4-214

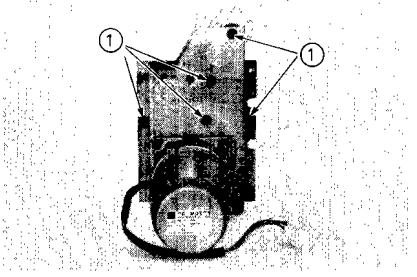
3) Disconnect the two connectors (2P and 6P).
4) Open the PCB unit.
5) Remove the three mounting screws then the turret motor unit.



① Mounting screws

Figure 4-215

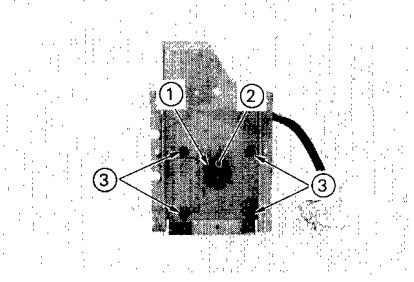
6) Remove the five mounting screws then the gear unit.



① Mounting screws

Figure 4-216

7) Loosen the setscrew, and remove the gear.
8) Remove the four mounting screws then the turret motor.



① Setscrew ③ Mounting screws
② Gear

Figure 4-217

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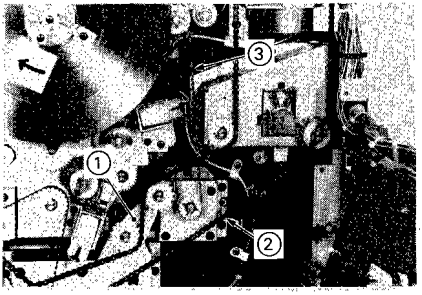
E. Turret Lock Unit

1. Removing the Turret Lock Unit

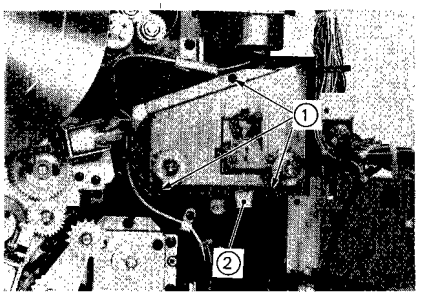
1) Open the PCB unit.
2) Move the arm, and remove the chain.
3) Remove the drive belt.



① Arm ③ Drive belt
② Chain

Figure 4-218

4) Disconnect the connector (5P)
5) Remove the three mounting screws then the turret lock unit.



① Mounting screws ② Connector

Figure 4-219

2. Cam Position

Turn the sprocket clockwise to adjust the position of the control ring so that the cam and lock arm is 3 ±2 mm away from each other when the control ring stops.

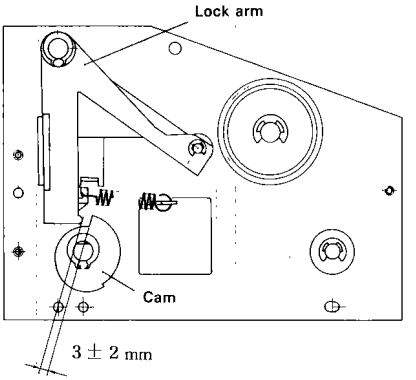


Figure 4-220

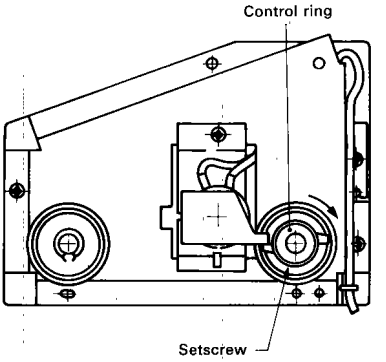


Figure 4-221

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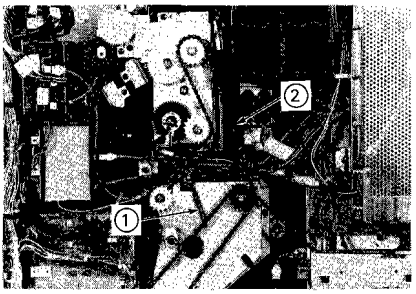
F. Fixing/Feeder Drive Unit

1. Removing the Fixing/Feeder Drive Unit

1) Remove the spring then the chain.



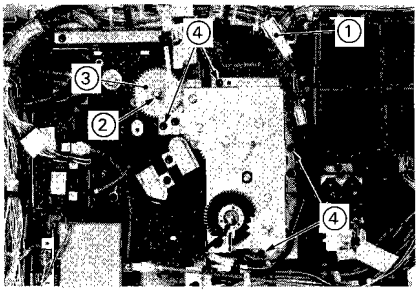
① Spring ② Chain

Figure 4-222

2) Disconnect the connector (4P).
3) Remove the E-ring, and remove the gear.

Note:
Do not drop the parallel pin.

4) Remove the four mounting screws, and remove the fixing/feeder drive unit.



① Connector ③ Gear
② E-ring ④ Mounting screws

Figure 4-223

2. 53T Gear (FS2-0534) Position

The 53T gear is equipped with a one-way clutch inside it; as such, care should be taken as wrong orientation results in transmission failure.

Fixing drive unit: Mount it so that A is toward the inside.
Feeder drive unit: Mount it so that A is toward the rear cover.

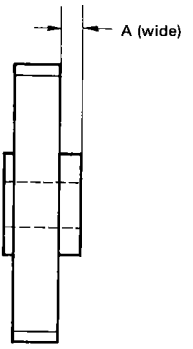


Figure 4-224 53T Gear

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G. Transfer Drum Assembly Drive Unit

1. Construction

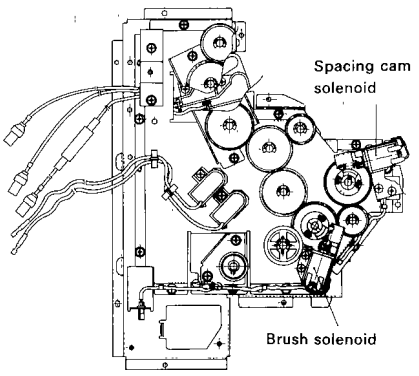


Figure 4-225

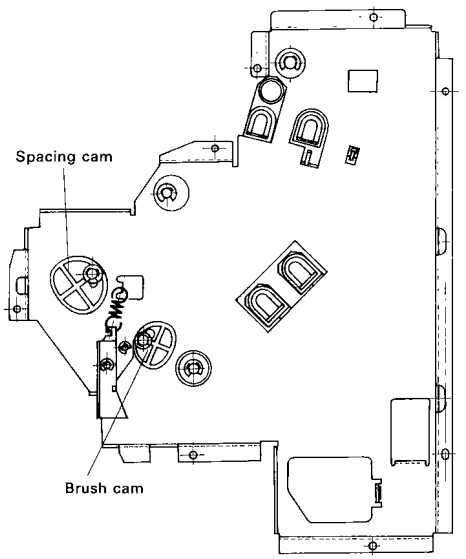


Figure 4-226 Home positions of cams

2. Solenoid Mounting Positions

Mount the solenoids so that the plunger stroke is 2.7 ±0.5 mm.

Note:
This is true for all solenoids.

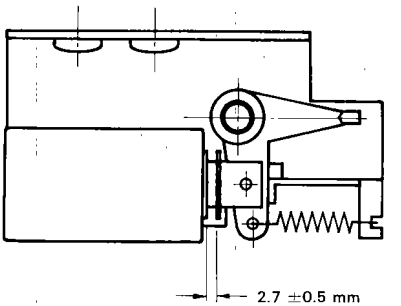
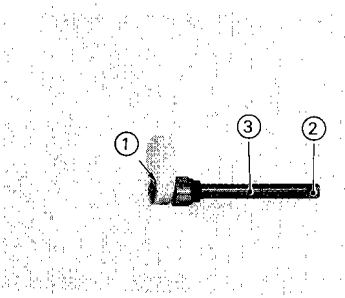


Figure 4-227

3. Cam Mounting Positions

Mount the cam so that the boss of the cam is at A of the drive shaft.



① Boss
② A
③ Drive shaft

Figure 4-228

Mount the cam at the position shown in Figure 4-226 with the solenoid OFF.

4. Oiling

Oil the spring clutch unit with low viscosity lubricating oil.

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III. PAPER FEED SYSTEM

A. Pick-up Control Unit

1. Construction

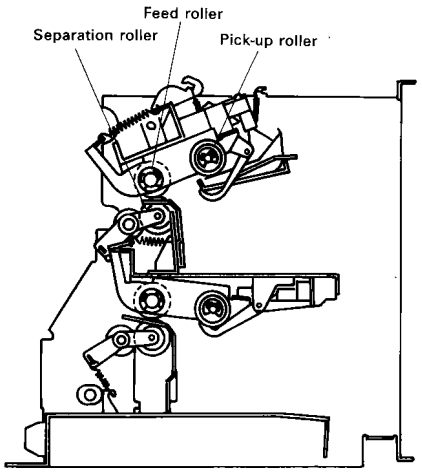


Figure 4-300 Cross-sectional view

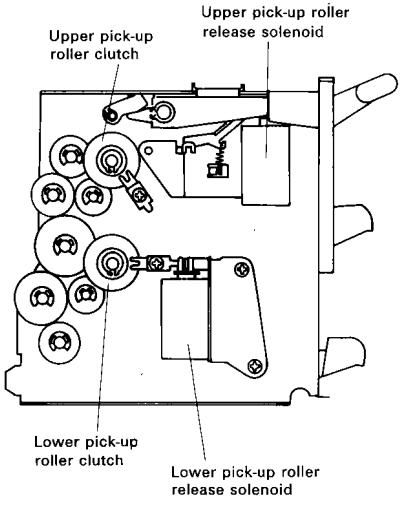
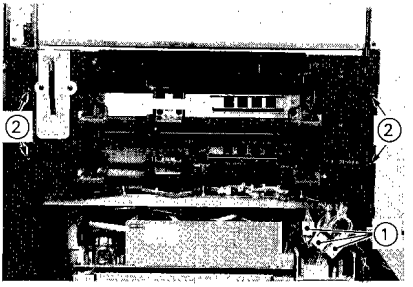

Upper pick-up roller release solenoid
Upper pick-up roller clutch
Lower pick-up roller clutch
Lower pick-up roller release solenoid

Figure 4-301 Front view

2. Removing the Cassette Holder

1) Disconnect the three connectors.
2) Remove the four mounting screws, and remove the cassette holder.

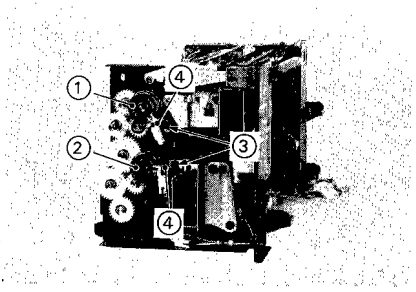


① Connectors
② Mounting screws

Figure 4-302

3. Removing the Pick-up Roller Clutch

1) Remove the cassette holder from the machine.
2) Disconnect the connector.
3) Remove the mounting screw then the clutch lock plate.



① Upper pick-up roller clutch
② Lower pick-up roller clutch
③ Mounting screws
④ Clutch lock plates

Figure 4-303

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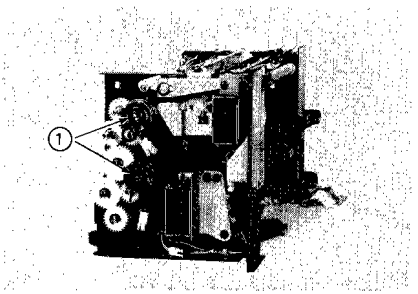
4) Remove the grip ring then the pick-up roller clutch.

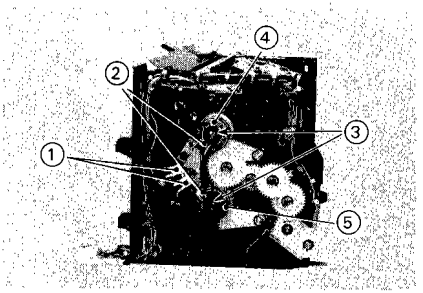


① Grip rings

Figure 4-304

4. Removing the Upper or Lower Lifter Clutch

1) Remove the cassette holder from the machine.
2) Disconnect the connector.
3) Remove the mounting screw then the clutch lock plate.
4) Remove the grip ring then the lifter clutch.

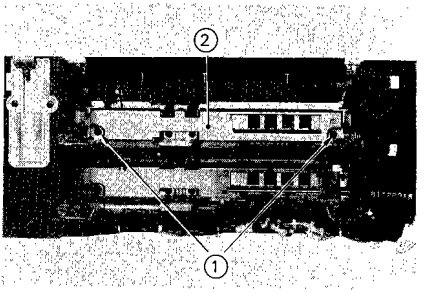


① Connectors
② Clutch lock plates
③ Grip rings
④ Upper lifter clutch
⑤ Lower lifter clutch

Figure 4-305

5. Removing the Upper Separation/ Feed/Pick-up Roller for CLC 500

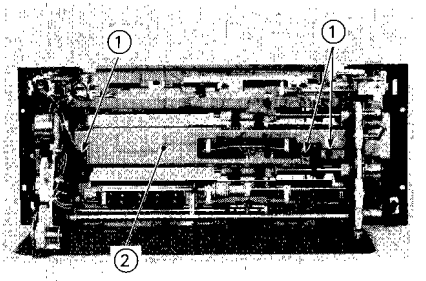
1) Remove the cassette holder from the machine.
2) Remove the two mounting screws then the upper pick-up paper guide plate.



① Mounting screws
② Upper pick-up paper guide plate

Figure 4-306

3) Remove the three mounting screws then the pick-up paper guide plate.



① Mounting screws
② Pick-up paper guide plate

Figure 4-307

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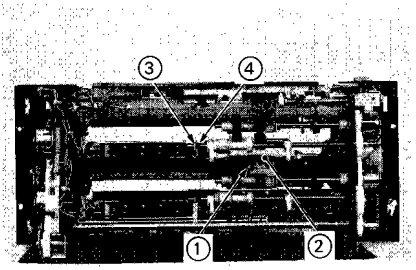
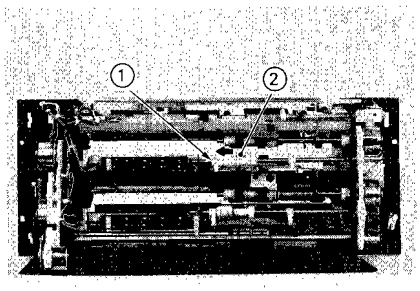
4) Remove the spring then the spring hook plate.
5) Remove the retaining ring with fingers or pliers, and remove the bushing.



① Spring
② Spring hook plate
③ Retaining ring
④ Bushing

Figure 4-308

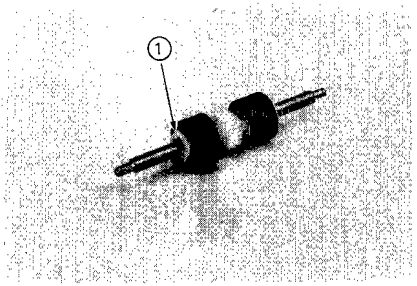
6) Press the separation roller shaft toward the front side plate then pull it toward the front.
7) Remove the retaining ring then the separation roller unit.



① Retaining ring
② Separation roller unit

Figure 4-309

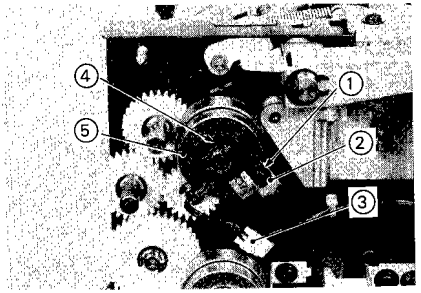
8) Remove the retaining ring then the separation roller.



① Retaining ring

Figure 4-310

9) Remove the mounting screw then the clutch lock plate.
10) Remove the connector and grip ring, then the upper pick-up roller clutch.



① Mounting screw
② Clutch lock plate
③ Connector
④ Grip ring
⑤ Upper pick-up roller clutch

Figure 4-311

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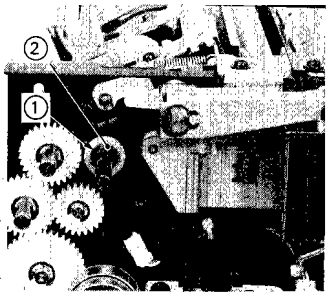
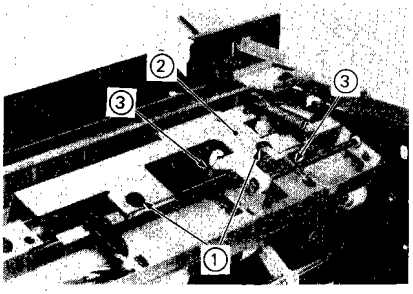
11) Remove the E-ring, and the ball bearing.



① E-ring ② Ball bearing

Figure 4-312

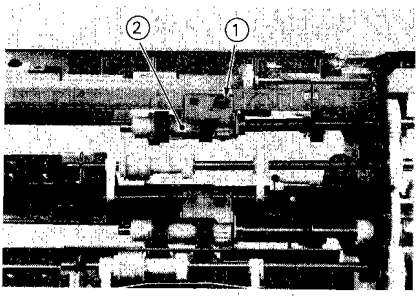
12) Remove the mounting screw then the upper cassette paper sensor.
13) Remove the two springs.



① Mounting screws ③ Springs
② Upper cassette paper sensor

Figure 4-313

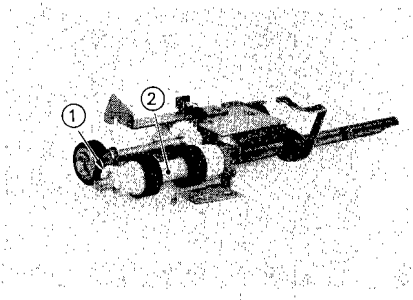
14) Remove the mounting screw then the pick-up roller unit.



① Mounting screw ② Pick-up roller unit

Figure 4-314

15) Remove the retaining ring then the feed roller.



① Retaining ring ② Feed roller

Figure 4-315

16) Remove the two E-rings then pick-up roller 2.

Notes:
1. Do not drop the dowel.
2. Make sure that the arrow on the pick-up roller points in the correct direction when the pick-up roller is mounted.

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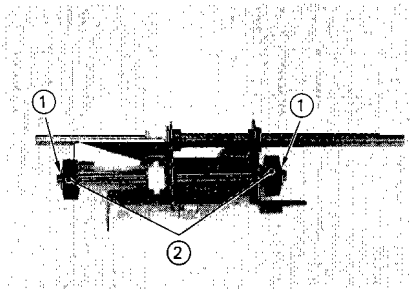
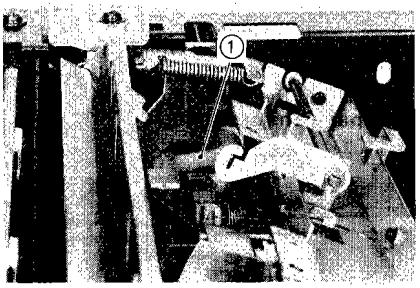


① E-rings ② Pick-up roller

Figure 4-316

■ Notes on reassembly

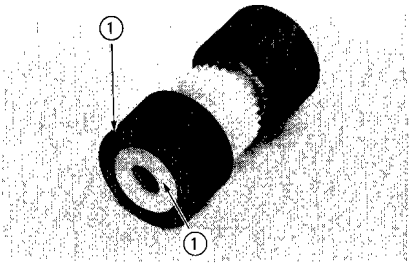
a. Mount the pick-up roller unit above the pick-up roller release lever.



① Pick-up roller release lever

Figure 4-317

b. Mount the separation roller so that the section shown in Figure 4-318 is toward the inner side of the cassette holder (rear of the machine).

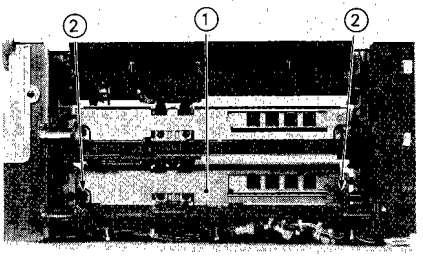


① Cut-out

Figure 4-318

6. Removing the Lower Separation/ Feed/Pick-up Rollers for CLC 500

1) Remove the cassette holder from the machine.
2) Remove the two mounting screws then lower pick-up guide plate I.



① Lower pick-up guide plate I ② Mounting screws

Figure 4-319

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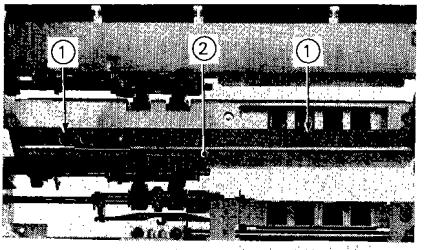
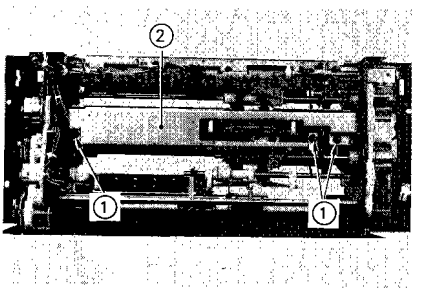
3) Remove the two mounting screws then lower pick-up guide plate II.



① Mounting screws
② Lower pick-up guide plate II

Figure 4-320

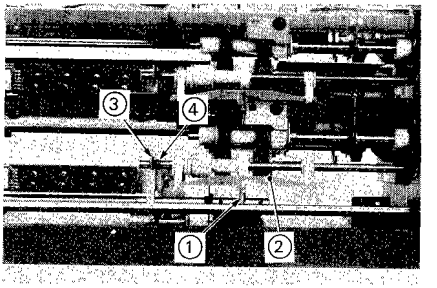
4) Remove the three mounting screws then the pick-up guide plate.



① Mounting screws
② Pick-up guide plate

Figure 4-321

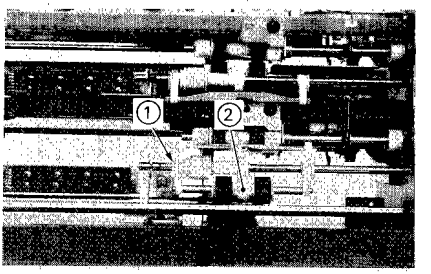
5) Remove the spring then the spring hook plate.
6) Remove the retaining ring then the bushing.



① Spring
② Spring hook plate
③ Retaining ring
④ Bushing

Figure 4-322

7) Press the separation roller shaft toward the front side plate then pull it out.
8) Remove the retaining ring then the separation roller unit.



① Retaining ring
② Separation roller unit

Figure 4-323

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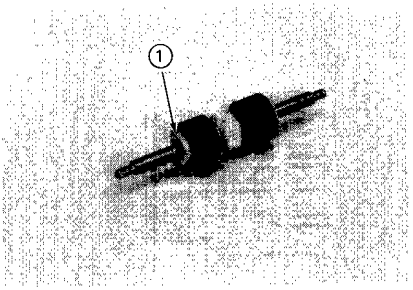
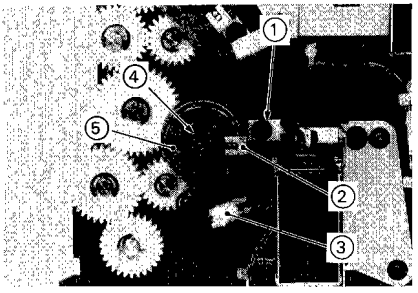
9) Remove the retaining ring then the separation roller.



① Retaining ring

Figure 4-324

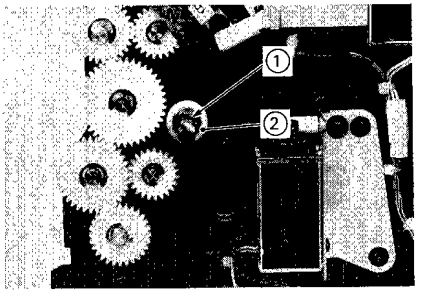
10) Remove the mounting screw then the clutch lock plate.
11) Remove the connector and grip ring, then the lower pick-up roller clutch.



① Mounting screw
② Clutch lock plate
③ Connector
④ Grip ring
⑤ Lower pick-up roller clutch

Figure 4-325

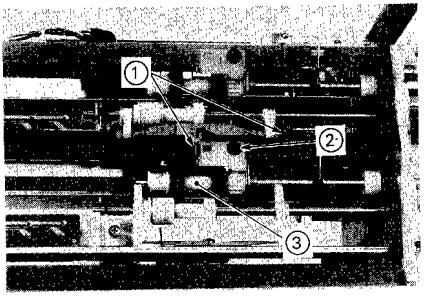
12) Remove the E-ring then the ball bearing.



① E-ring
② Ball bearing

Figure 4-326

13) Remove the two springs.
14) Remove the mounting screw then the pick-up roller unit.



① Springs
② Mounting screw
③ Pick-up roller unit

Figure 4-327

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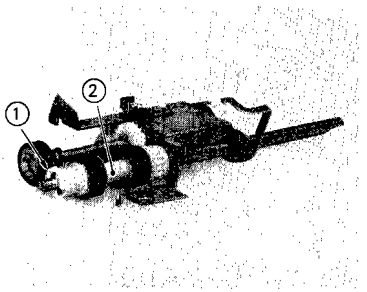
15) Remove the retaining ring then the feed roller.

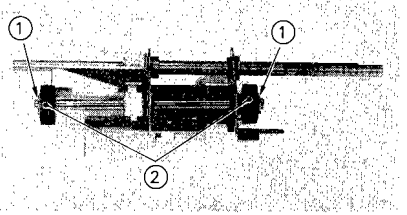


① Retaining ring ② Feed roller

Figure 4-328

16) Remove the two E-rings then the two pick-up rollers.

Notes:
1. Be careful not to lose the dowel.
2. Make sure that the arrow on the pick-up roller points in the correct direction when the pick-up roller is mounted.

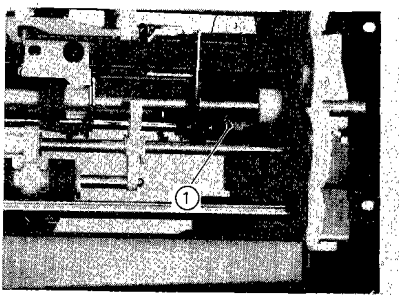


① E-rings ② Pick-up roller

Figure 4-329

■ Notes on reassembly

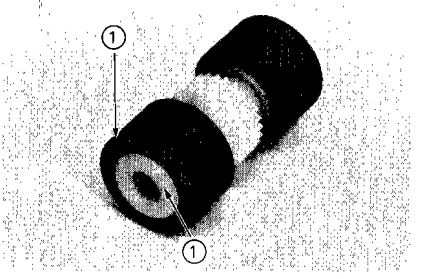
a. Mount the pick-up roller unit above the pick-up roller release lever.



① Pick-up roller engage lever

Figure 4-330

b. Mount the separation roller so that the section shown in Figure 4-331 is toward the inner side of the cassette holder (rear of the machine).



① Cut-out

Figure 4-331

Note:
1. Take care not to drop the pins.
2. When attaching the pick-up roller, pay attention to the direction of rotation indicated by an arrow on the roller.

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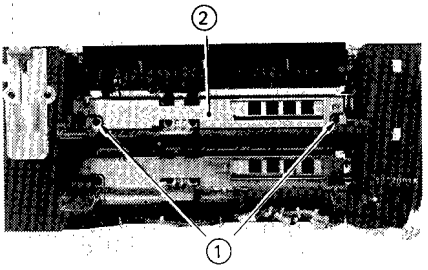
7. Detaching the Upper Cassette Separation, Feeding, and Pick-Up Rollers (CLC550)

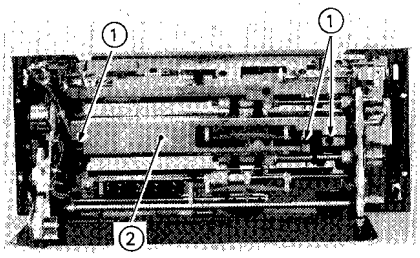
1) Detach the cassette holder from the copier.
2) Remove the two screws, and detach the upper cassette pick-up guide plate.



① Screw ② Upper cassette pick-up guide plate

Figure 4-332

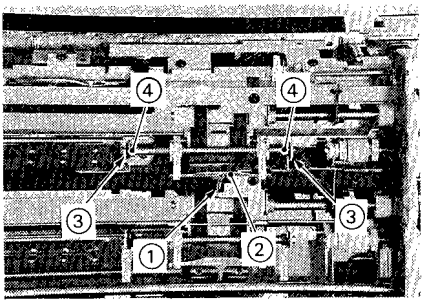
3) Remove the three screws, and detach the pick-up guide plate.



① Screws ② Pick-up guide plate

Figure 4-333

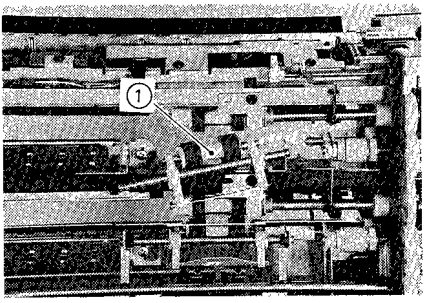
4) Remove the spring, and detach the spring hook plate.
5) Remove the two stop rings, and detach the two bushings.



① Spring ③ Stop rings
② Spring hook plate ④ Bushings

Figure 4-334

6) Detach the separation roller unit.



① Separation unit

Figure 4-335

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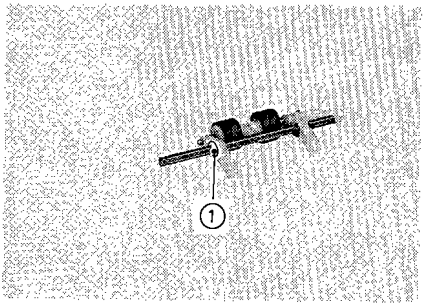
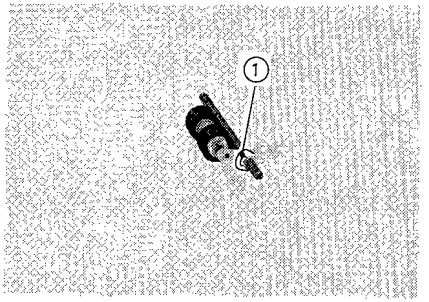
7) Remove the stop ring, and detach the separation roller.



① Stop ring

Figure 4-336

8) Remove the stop ring, and detach the separation roller. (At the time, take care not to lose the pin.)

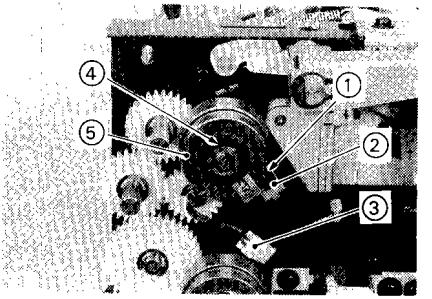


① Stop ring

Figure 4-337

9) Remove the screw, and detach the clutch stop plate.

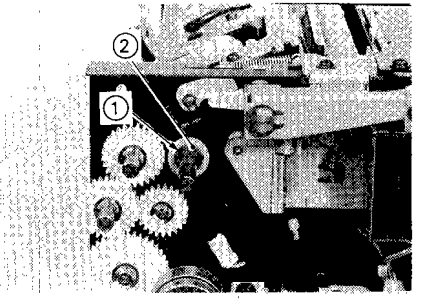
10) Detach the connector and the grip stop ring, and detach the upper cassette pick-up clutch.



① Screw
② Clutch stop plate
③ Connector
④ Grip stop ring
⑤ Upper cassette pick-up clutch

Figure 4-338

11) Remove the E-ring, and detach the bushing.



① E-ring
② Bushing

Figure 4-339

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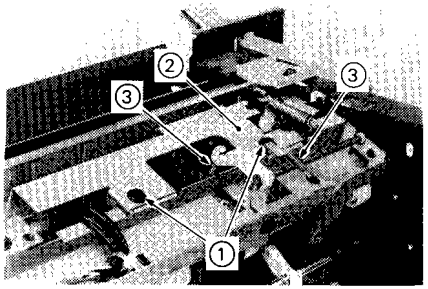
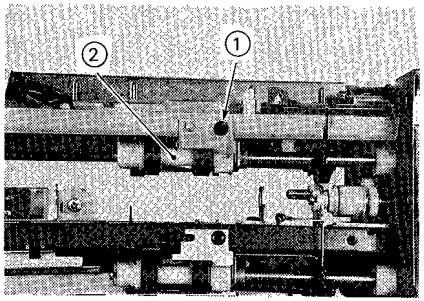
12) Remove the two screws, and detach the upper cassette paper sensor.
13) Remove the two springs.



① Screws ③ Spring
② Upper cassette paper sensor

Figure 4-340

14) Remove the screw, and detach the pick-up roller assembly.



① Screw ② Pick-up roller assembly

Figure 4-341

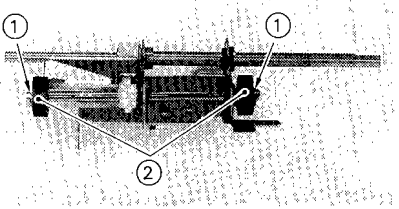
15) Remove the stop ring, and detach the feeding roller.

① Stop ring ② Feeding roller

Figure 4-342

16) Remove the two E-rings, and detach the two pick-up rollers.

Note:
1. Take care not to drop the pin.
2. When attaching the pick-up roller, pay attention to the direction of rotation indicated by an arrow on the roller.



① E-ring ② Pick-up roller

Figure 4-343

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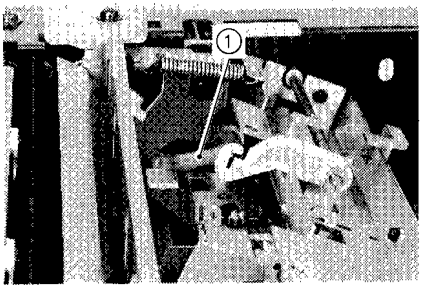
■ Points to Note

a. Attach the pick-up roller assembly so that it is above the pick-up roller release lever.

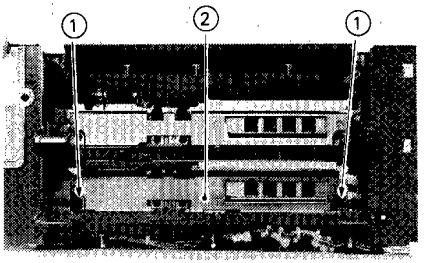


① Pick-up roller release lever

Figure 4-344

8. Detaching the Lower Cassette Separation, Feeding, and Pick-Up Rollers (CLC550)

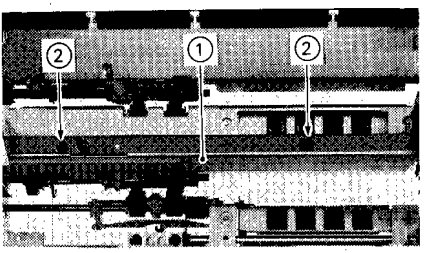
1) Detach the cassette holder from the copier.
2) Remove the two screws, and detach the lower cassette guide plate I.



① Lower cassette pick-up guide plate I ② Screws

Figure 4-345

3) Remove the two screws, and detach the lower cassette guide plate II.



① Screw ② Lower cassette pick-up guide plate II

Figure 4-346

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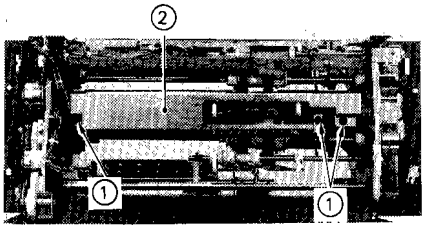
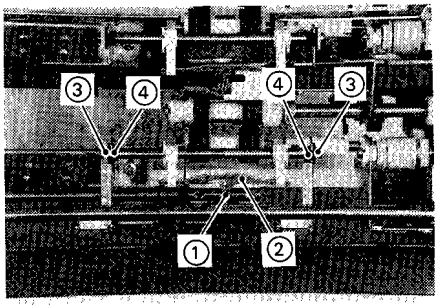
4) Remove the three screws, and detach the pick-up guide plate.



① Screws ② Pick-up guide plate

Figure 4-347

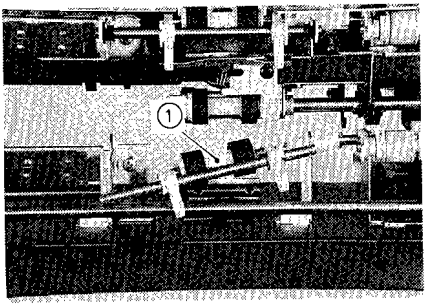
5) Remove the spring, and detach the spring hook plate.
6) Remove the two stop rings, and detach the two bushings.



① Spring ③ Stop ring
② Spring hook plate ④ Bushing

Figure 4-348

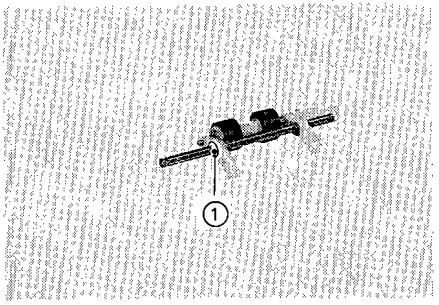
7) Detach the separation unit.



① Separation unit

Figure 4-349

8) Remove the stop ring, and detach the separation roller.



① Stop ring

Figure 4-350

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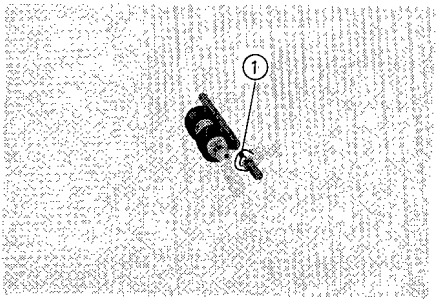
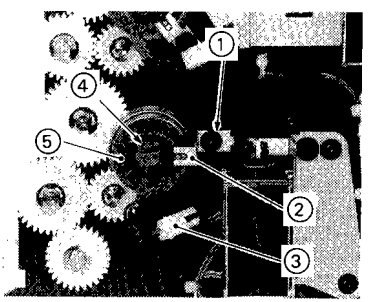
9) Remove the stop ring, and detach the separation roller. (At the time, take care not to drop the pin.)



① Stop ring

Figure 4-351

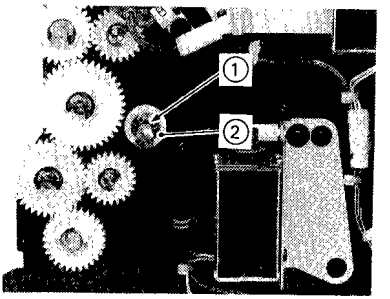
10) Remove the screw, and detach the clutch stop plate.
11) Disconnect the connector, and remove the grip stop ring; then, detach the lower cassette pick-up clutch.



① Screw
② Clutch stop plate
③ Connector
④ Grip stop ring
⑤ Lower cassette pick-up clutch

Figure 4-352

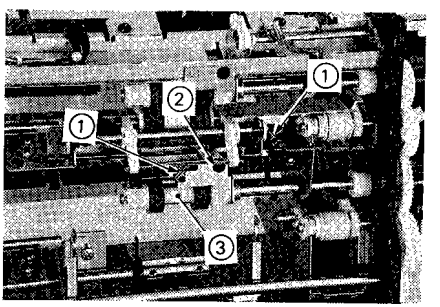
12) Remove the E-ring, and detach the bushing.



① E-ring ② Bushing

Figure 4-353

13) Remove the two springs.
14) Remove the screw, and detach the pick-up roller assembly.



① Spring
② Screw
③ Pick-up roller assembly

Figure 4-354

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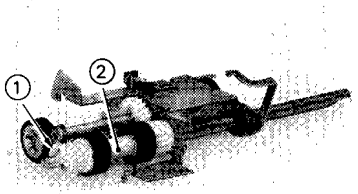
15) Remove the stop ring, and detach the feeding roller.

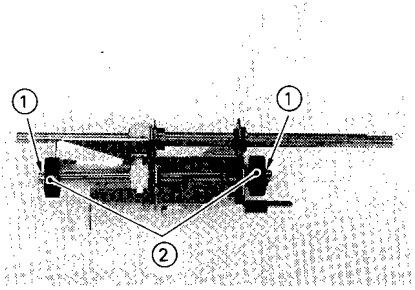


① Stop ring ② Feeding roller

Figure 4-355

16) Remove the two E-rings, and detach the two pick-up rollers.

Note:
1. **Take care not to drop the pin.**
2. **When attaching the pick-up roller, pay attention to the direction of rotation indicated by an arrow on the roller.**

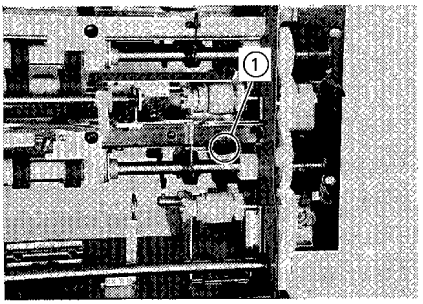


① E-rings ② Pick-up rollers

Figure 4-356

■ Points to Note

a. Attach the pick-up roller assembly so that it is above the pick-up roller release lever.



① Pick-up roller release lever

Figure 4-357

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9. Adjusting Solenoid Strokes

Mount the solenoid so that the distance between the top of the plunger and the center of the hole is the value shown in Figure 4-358 below.

a. Mounting Position of Lower Pick-up Roller Release Solenoid

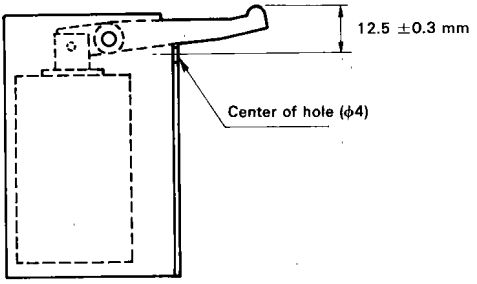


Figure 4-358

b. Mounting Position of Upper Pick-up Roller Release Solenoid

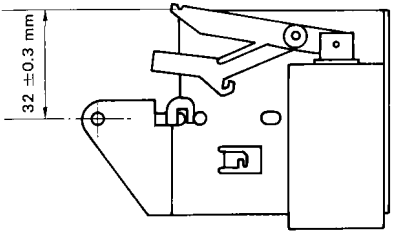
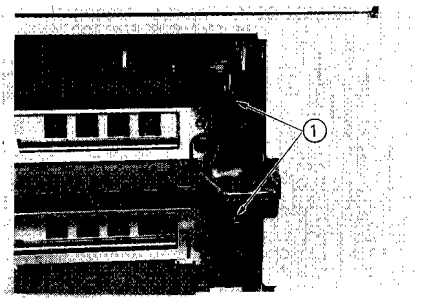


Figure 4-359

10. Releasing the Lifter

Push up the levers shown in Figure 4-360 to raise or lower the lifter.

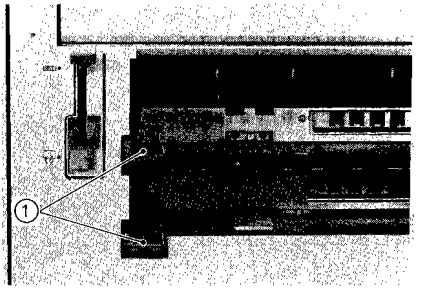


① Levers

Figure 4-360

11. Adjusting the Cassette Position

To adjust the cassette position, move the cassette holder shown in Figure 4-361 to the right or left.



① Cassette holder

Figure 4-361

If the cassette holder is moved to the left, make sure that the cassette can be pushed in smoothly all the way.

12. Oiling

Oil the one-way clutch unit with lubricating oil.

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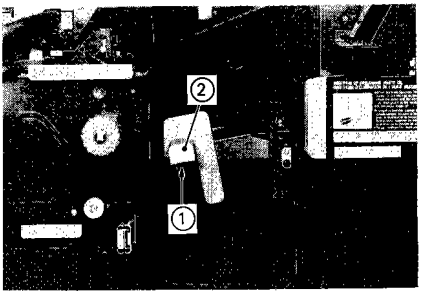
B. Registration Roller Unit

1. Removing the Registration Roller Unit

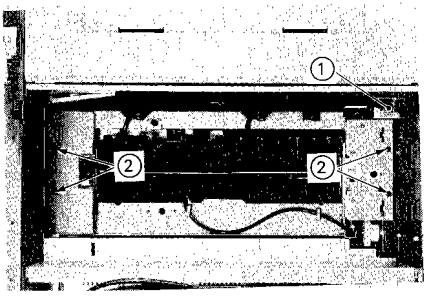
1) Remove the mounting screw then the release handle.



① Mounting screw ② Release handle

Figure 4-362

2) Remove the cassette holder.
3) Disconnect the connector.
4) Remove the four mounting screws, and pull out the registration roller unit toward the front.

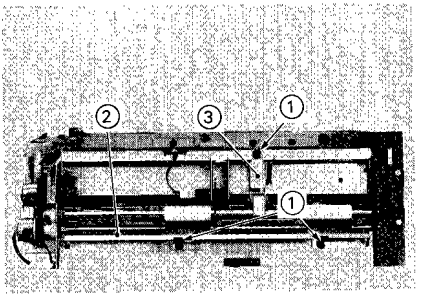


① Connector ② Mounting screws

Figure 4-363

2. Removing the Registration Roller

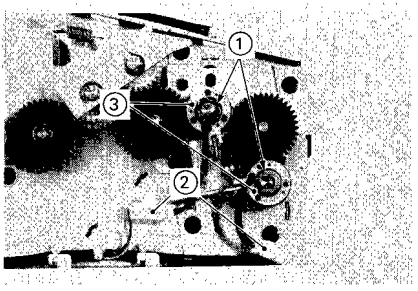
1) Remove the registration roller unit from the machine.
2) Remove the two mounting screws then the paper guide plate.
3) Remove the mounting screw then the pressure plate.



① Mounting screws
② Paper guide plate
③ Pressure plate

Figure 4-364

4) Remove the two grip rings, pull out the two connectors, and remove the two electromagnetic clutches.



① Grip ring
② Connectors
③ Electromagnetic clutches

Figure 4-365

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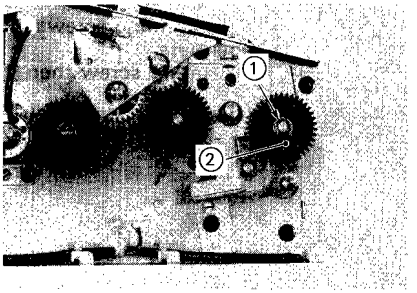
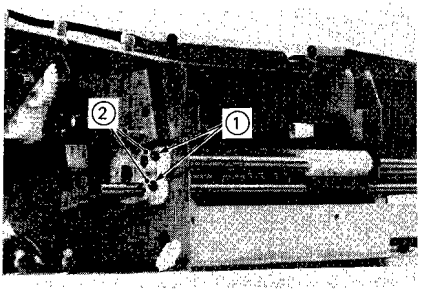
5) Remove the E-ring and gear.



① E-ring ② Gear

Figure 4-366

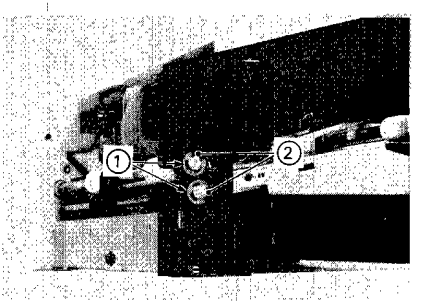
6) Remove the two mounting screws then the gear and bushing.



① Mounting screws ② Gear

Figure 4-367

7) Remove the E-rings, bushings, then the registration roller.



① E-rings ② Bushings

Figure 4-368

3. Oiling

Oil the spring clutch unit with low viscosity lubricating oil.

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C. Transfer Drum Unit

1. Construction

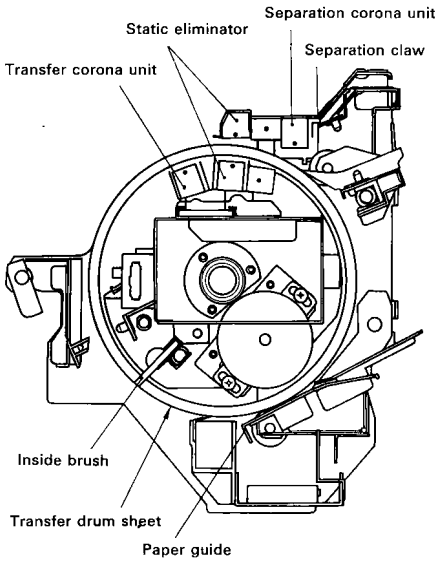
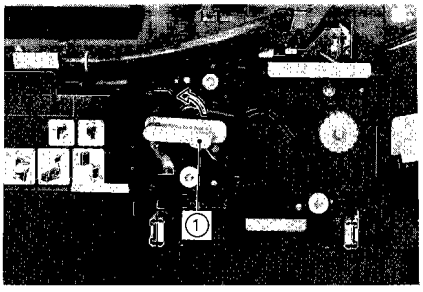


Figure 4-369

2. Removing the Transfer Drum Unit From the Machine

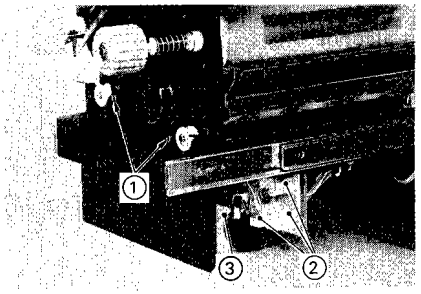
1) Turn the release handle counter-clockwise.



① Release handle

Figure 4-370

2) Pull the transfer drum unit toward the front.
3) Remove the two stepped screws, grounding wire and disconnect the three connectors.



① Stepped screws ③ Grounding wire
② Connectors

Figure 4-371

4) Hold the release handle shaft and cross-member, and pull up the transfer drum unit.

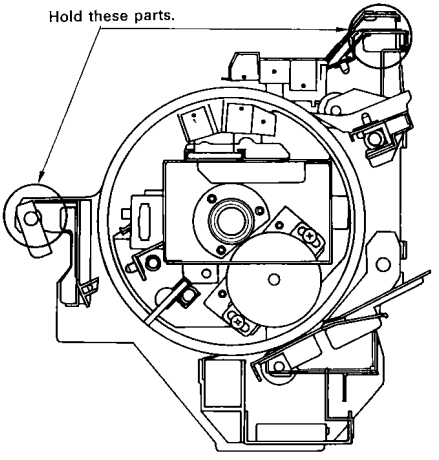


Figure 4-372

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3. Replacing the Transfer Drum Sheet

1) Strip off the old sheet from the transfer drum with the gripper open.
2) Strip off the old double-sided adhesive tape from the transfer drum and clean the adhesive faces of the tape with alcohol.
3) Tilt the transfer drum unit as shown in Figure 4-373.

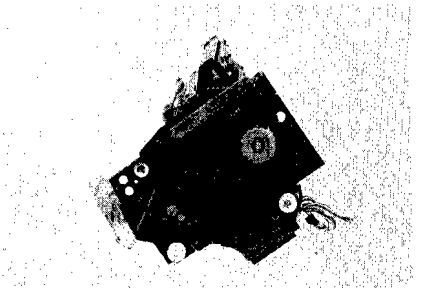
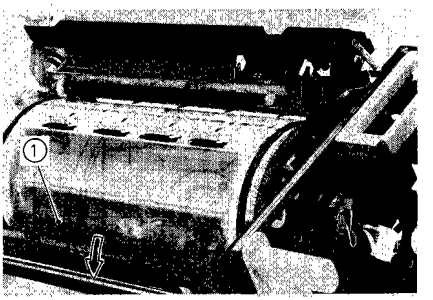


Figure 4-373

4) Remove the transfer corona/inner static charge eliminating corona and waste toner receptacle.
5) Open the separation/outer static charge eliminating corona.
6) Push the inside brush toward the outside to move the gripper cam; thereafter, turn the knob to open the gripper.



①Inner brush

Figure 4-374

7) Attach the grip tape (FA9-2395-000) to the transfer drum as shown in Figure 4-375.

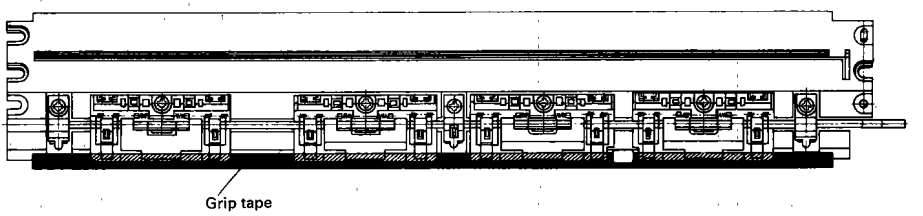


Figure 4-375

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8) Attach the tape as shown in Figure 4-376.

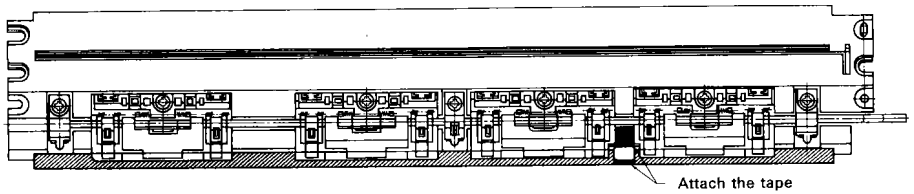
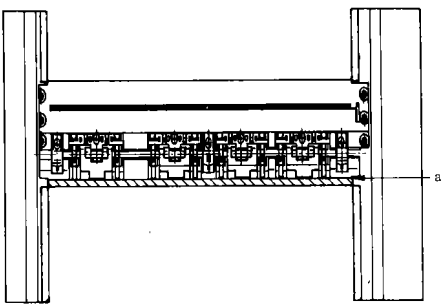


Figure 4-376

9) Attach the new transfer drum sheet so that the lower parts (b) of the square holes are aligned with the end (a) of the gripper.



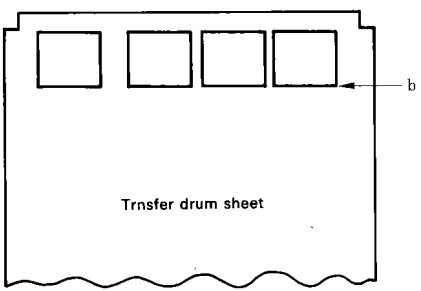


Figure 4-377

10) Attach the transfer drum sheet by pressing the part indicated by oblique lines in Figure 4-378 as shown.

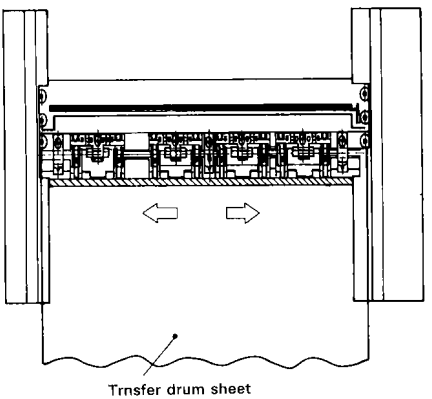


Figure 4-378

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11) While pulling the leading edge of the transfer drum sheet as shown, attach the leading edge of the sheet by pressing it firmly by hand.
Make sure that the folding part of the transfer drum sheet meets the gripper holes.

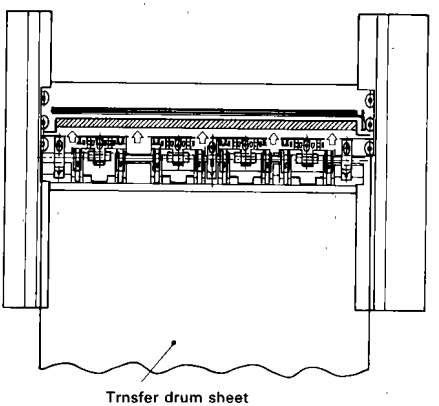

Figure 4-379

12) Support the rear of the transfer drum sheet lightly, and turn the knob of the transfer drum to attach the transfer drum sheet. At the time, take care so that no slack or bump forms at the center and edges of the transfer drum sheet.

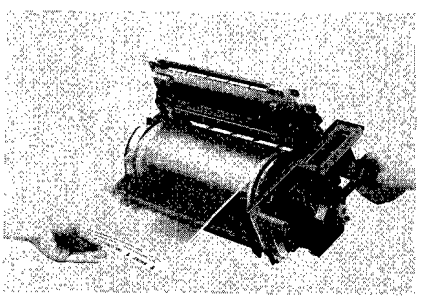

Figure 4-380

13) Attach the transfer drum sheet until the gripper reaches the transfer corona position.
14) Attach the transfer sheet while pressing both sides of the sheet against the flanges with the thumbs.

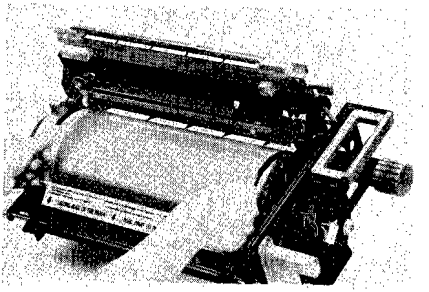

Figure 4-381

Note:
Do not pull the end of the transfer drum sheet with force; otherwise, the sheet will develop dents, leading to faulty transfer.

15) Press the center of the trailing edge of the transfer drum sheet and press the trailing edge toward both sides.

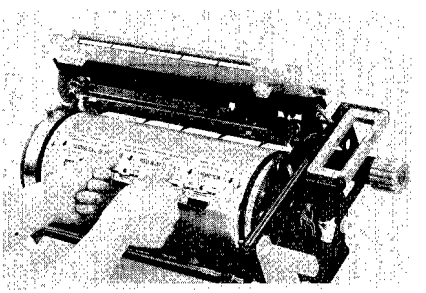

Figure 4-382

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16) Lightly press down the part of the transfer drum sheet as shown in Figure 4-383 and make sure that the leading edge of the transfer drum sheet is not raised.

Figure 4-383

18) Make sure that the transfer drum sheet is attached to the flanges of the transfer drum.
19) Place a 35-cm or longer ruler along the rubber spacers placed at the front and rear transfer drums, and make sure that the transfer drum sheet is not raised or loose.
If the sheet is loose for about 0.5 mm or more (target is 0.3 mm), reattach the sheet to prevent transfer faults.

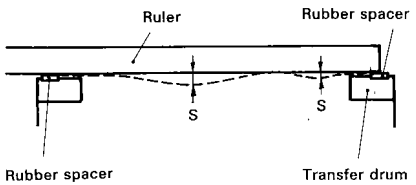
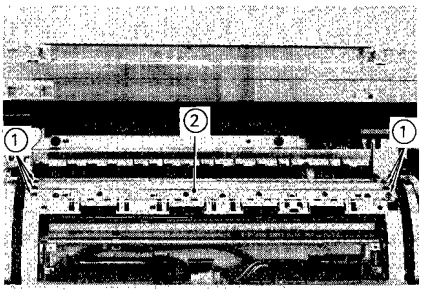


Figure 4-384

4. Gripper Unit

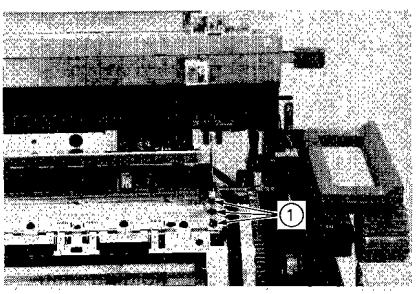
a. Removing the Gripper Unit
1) Remove the transfer drum unit from the machine.
2) Remove the transfer drum sheet.
3) Remove the three front screws fastening the gripper unit.
4) Loosen the three rear screws fastening the gripper unit, and remove the gripper unit.



① Screws ② Gripper unit

Figure 4-385

b. Mounting the Gripper Unit
1) Place the gripper unit on the flanges of the transfer drum.
2) Fasten the front of the gripper unit with three screws.



① Screws

Figure 4-386

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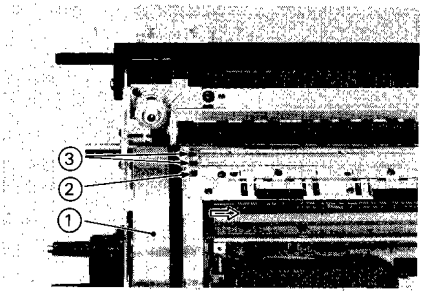
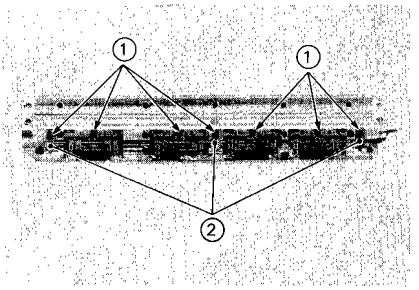
3) While pressing the rear flange toward the front, tighten screw A. Make sure that the flange is not tilted.
4) Tighten the remaining two screws to fasten the gripper unit.



① Rear flange ③ Screws (M3×4)
② Screw A (M3×4)

Figure 4-387

c. Removing the Gripper
1) Remove the gripper unit from the transfer drum.
2) Remove the seven mounting screws and remove the gripper shaft holding plate.



① Mounting screws (M3×4) ② Gripper shaft holding plate

Figure 4-388

3) Turn the gripper clockwise 180° and remove the gripper from the shaft.

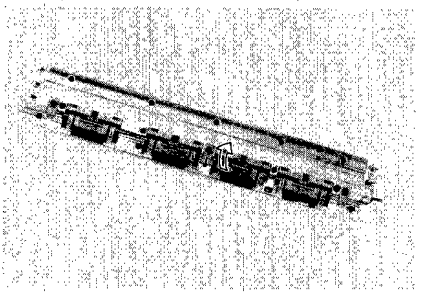


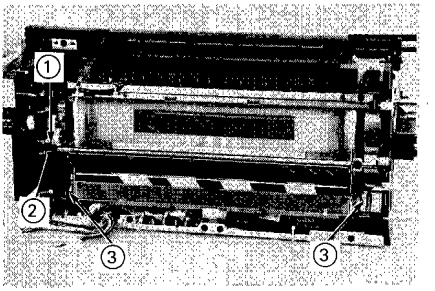
Figure 4-389

Note:
Be sure to use M3×3 screws to fix the gripper in place.

Note:
When attaching the gripper assembly to the transfer drum, make sure that the gripper assembly is securely fitted; otherwise, transfer faults along the leading edge or damage to the drum can occur.

5. Pick-Up Guide and Separation Claw Unit

a. Removing the Pick-Up Guide Plate
1) Remove the transfer drum unit from the machine.
2) Remove the screw, and remove the leaf spring and two springs.



① Screw ③ Springs
2 Leaf spring

Figure 4-390

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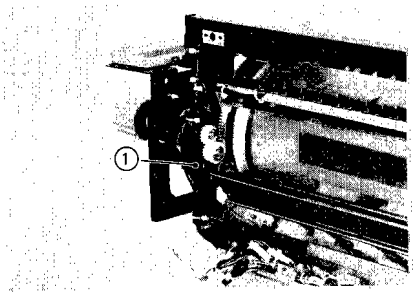
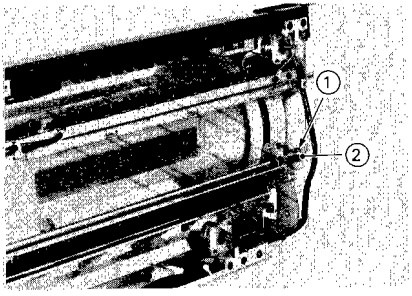
3) Move the bushing at the front of the pick-up guide plate toward the inside.



① Bushing

Figure 4-391

4) Remove the E-ring at the rear of the pick-up guide, and remove the bushing.



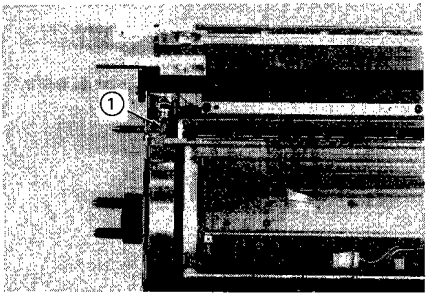
① E-ring ② Bushing

Figure 4-392

5) Remove the pick-up guide plate from the shaft.

b. Removing the Separation Claw Unit

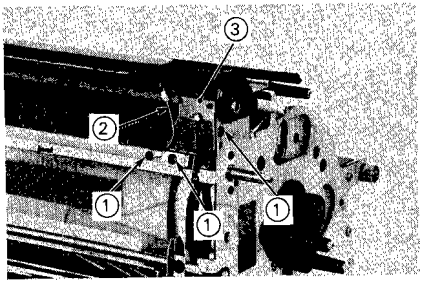
1) Remove the transfer drum unit from the machine.
2) Open the separation/static charge eliminator unit, and remove the spring.



① Spring

Figure 4-393

3) Remove the three screws, and remove the grounding wire and separation motor.



① Screws ③ Separation motor
② Grounding wire

Figure 4-394

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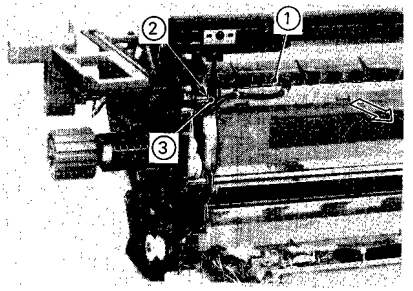
4) Disconnect the connector from the LED unit.
5) Remove the E-ring, move the bushing, and remove the separation claw unit from the shaft.



① Connector ③ Bushing
② E-ring

Figure 4-395

c. Separation Claw Position

Adjust the position of the roller mount with the roller in contact with the rubber spacer of the drum so that the gap between the separation claw and transfer drum sheet is $0 \pm^{0.3}_{0}$, mm.

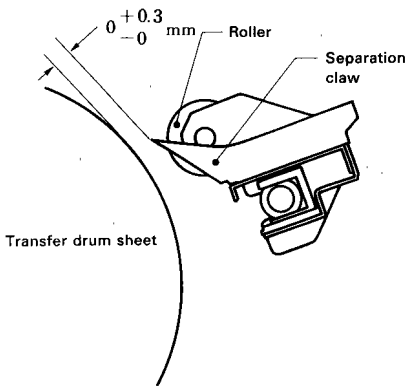
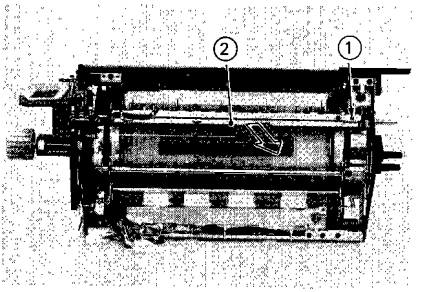


Figure 4-396

d. Removing the Corona Wire Unit

1) Remove the screw, and move the corona wire unit into the direction of the arrow (Figure 4-397) to remove.



① Screw ② Corona wire unit

Figure 4-397

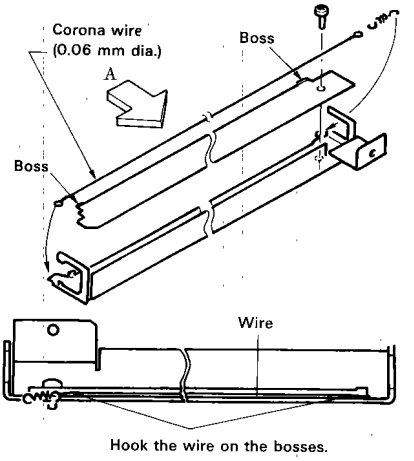


Figure 4-398 Fitting the corona wire

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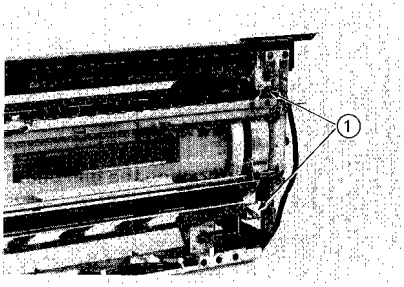
6. Replacing the Rubber Spacer

The rubber spacer may be left without replacement. If a tear is found, however, replace it as follows; bring the drum to the work shop if possible.

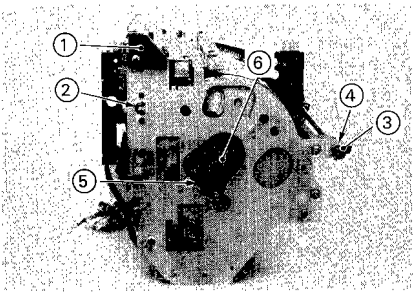
1) Remove the filter case from toner collection motor 2 (M10).
2) Peel the transfer drum sheet from the transfer drum.
3) Remove the leaf spring each from the separation claw unit and from pick-up guide plate.



① Springs

Figure 4-399

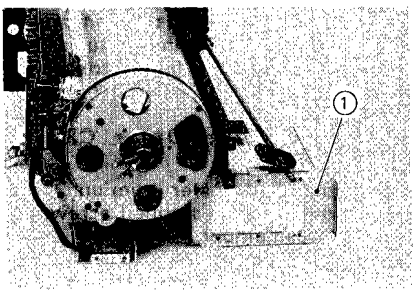
4) Remove the separation/static eliminator unit.
5) Remove the E-ring from the shaft of the separation unit.
6) Loosen the setscrew, and remove the collar and bushing.
7) Remove the screw, and remove the electrode cover.



① Separation/ static eliminator unit
② E-ring
③ Collar
④ Bushing
⑤ Screw
⑥ Electrode cover

Figure 4-3A0

8) Place the filter case removed in step 1) as shown in Figure 4-3A1 so that the transfer drum will not be displaced when the side plate at the rear of the transfer drum is removed in step 10).



① Filter case

Figure 4-3A1

9) Remove the two electrodes.

Note:
The bottom electrode is for the transfer corona.

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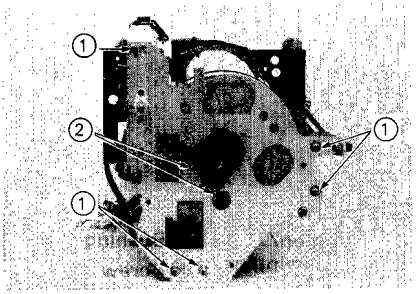
10) Remove the five stepped screws, and remove the side plate at the rear of the transfer drum.



① Stepped screw ② Electrode

Figure 4-3A2

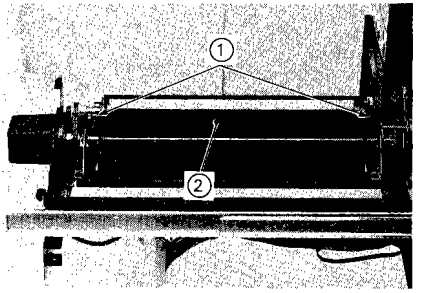
11) Remove the gripper unit, and pull out the flange at the rear of the transfer drum.
12) Remove the rubber spacer.

7. Inner Brush Mounting Position

Place a ruler between the front and rear flanges and mount the inner brush so that the end of the brush lightly touches the ruler.

8. Removing the Outer Cleaning Brush

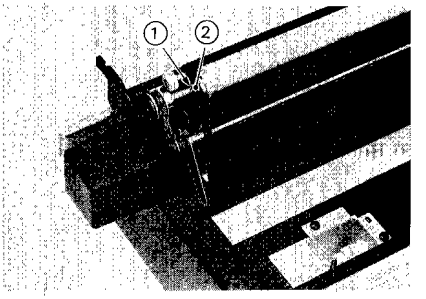
1) Remove the transfer drum unit.
2) Remove the two stepped screws then the crossmember.



① Stepped screws ② Crossmember

Figure 4-3A3

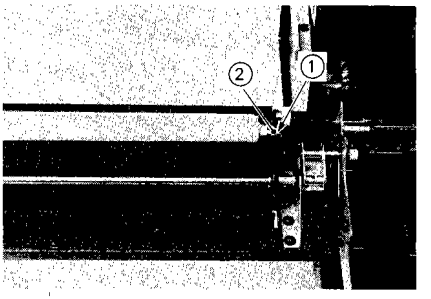
3) Remove the E-ring and pull the ball bearing toward the front.



① E-ring ② Ball bearing

Figure 4-3A4

4) Remove the E ring then the ball bearing.



① E-ring ② Ball bearing

Figure 4-3A5

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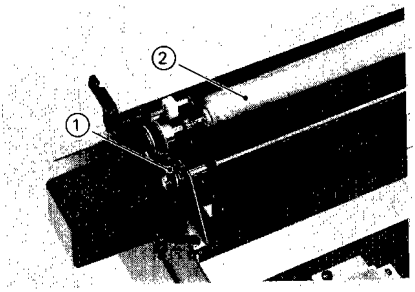
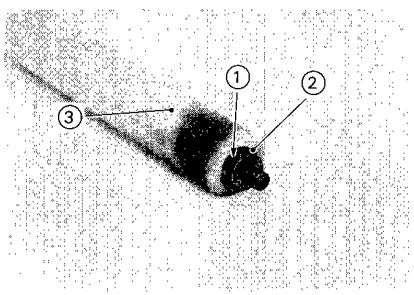
5) Remove the front belt then the outer cleaning brush unit.



① Belt
② Outer cleaning brush unit

Figure 4-3A6

6) Loosen the setscrew and remove the collar and outer cleaning brush.



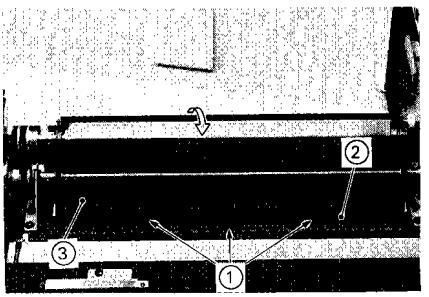
① Setscrew
② Collar
③ Outer cleaning brush

Figure 4-3A7

The procedure for mounting the outer cleaning brush is the opposite of the procedure used to remove it. Place the crossmember so that the tops of both ends are even.

9. Removing the Toner Receptacle From the Outer Cleaning Brush Unit

1) Remove the transfer drum unit.
2) Remove the two mounting screws, and remove the seal support plate.
3) Remove the mounting screw of the toner receptacle, turn the outer cleaning brush unit clockwise, and remove the toner receptacle.



① Mounting screws
② Seal support plate
③ Toner receptacle

Figure 4-3A8

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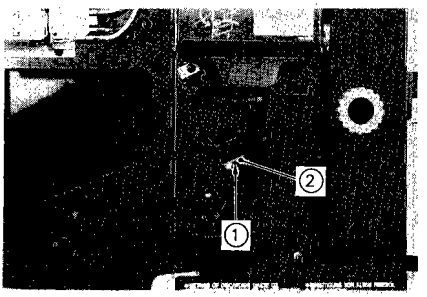
D. Feeder Unit

1. Removing the Feeder Unit

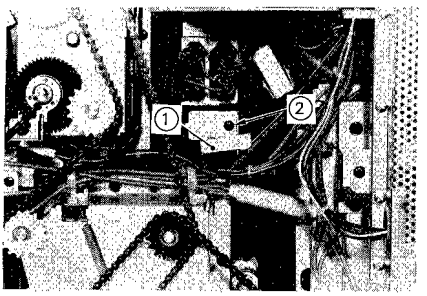
1) Remove the fixing assembly.
2) Remove the pre-fixing coronas.
3) Remove the mounting screw then the support plate of the pre-fixing corona (lower).



① Mounting screw ② Support plate

Figure 4-3A9

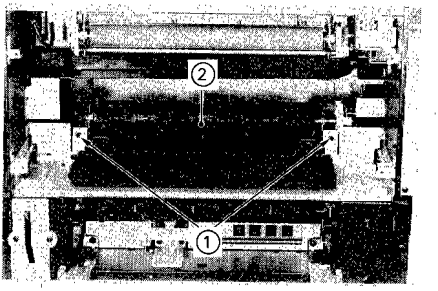
4) Disconnect the feeder fan connector.



① Connector ② Screw

Figure 4-3B0

5) Remove the two mounting screws then the feeder unit.



① Mounting screw ② Feeder unit

Figure 4-3B1

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IV. EXPOSURE SYSTEM

A. Laser/Scanning Mirror Motor Unit

1. Construction

The laser/scanner system consists of a laser unit, a scanning mirror motor unit, and a beam focusing optical system. The scanning mirror motor unit consists of a prism mirror (scanning mirror) and the scanning mirror motor (scanner motor). Do not remove the mirror cover that covers the upper part of the unit.

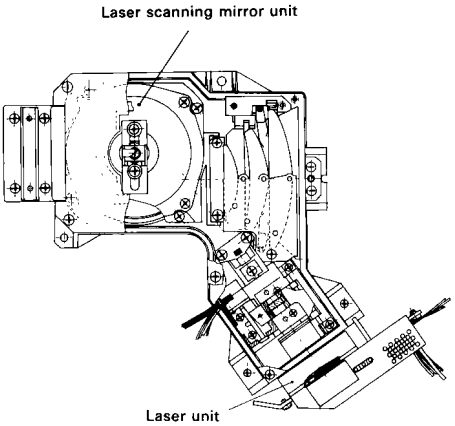
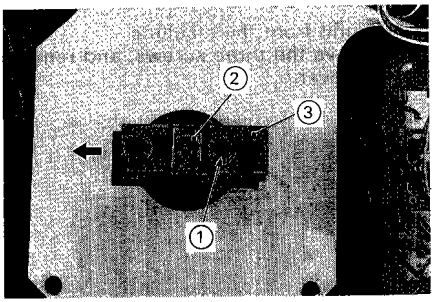


Figure 4-400

2. Removing the Laser/Scanning Mirror Motor Unit

Notes:
1. When servicing the laser/scanning mirror motor unit or the scanning mirror motor, be sure to unplug the printer power cord before beginning work.
2. When removing or attaching the laser/scanning mirror motor unit, be careful not to scratch the scanning mirror motor drive PCB.
3. Do not tilt the laser/scanning mirror motor unit excessively or turn it upside down when the lock of the scanning mirror motor is released.

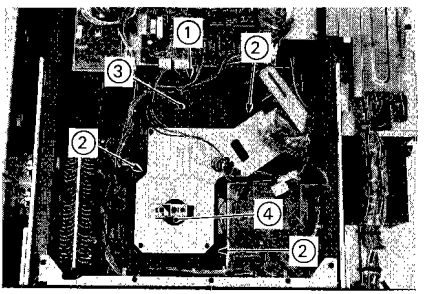
1) Slide the top cover of the machine to the right.
2) Remove the top plate.
3) Make sure that the scanning mirror motor has stopped rotating, push down the scanning mirror motor unit shaft, and loosen (90° to 180°) the screw of the scanning mirror drive motor lock plate. Then, slide the lock plate as shown to lock the scanning mirror motor.



① Screw
② Shaft
③ Lock plate

Figure 4-401

4) Unplug connector J205 from the DC driver PCB.
5) Disconnect connectors J202 and J203 from the laser scanner driver PCB.
6) Disconnect the two connectors for the auto focus.
7) Disconnect the two connectors for the laser driver PCB.
8) Remove the screw and take out the optical path unit.
9) Remove the three screws and take out the laser/scanning mirror motor unit.



① Screws (M4×6)
② Screws (M4×12)
③ Optical path unit
④ Laser/scanning mirror motor unit

Figure 4-402

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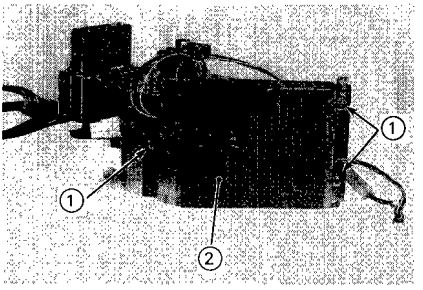
Note:
Before installing the laser/scanning mirror motor unit, thoroughly clean the mounting surfaces.

3. Removing the Laser Unit

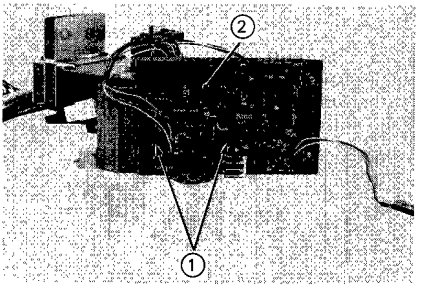
1) Remove the laser/scanning mirror motor unit from the machine.
2) Remove the three screws, and remove the cover.



① Screws ② Cover

Figure 4-403

3) Loosen the two setscrews and take out the laser unit.



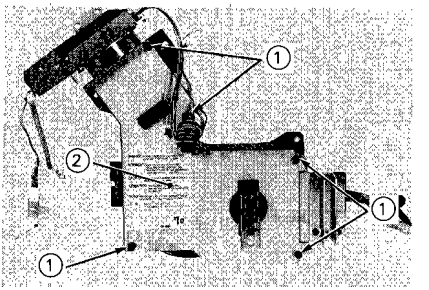
① Setscrews ② Laser unit

Figure 4-404

Note:
Pay attention not to touch, crack, or allow dust to get on the mounting face of the laser unit.

4. Removing the Scanning Mirror Motor Unit

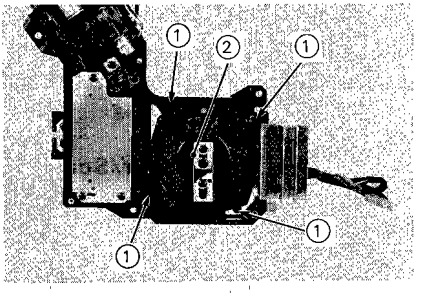
1) Remove the laser/scanning mirror motor unit from the machine.
2) Remove the five screws then the top cover of the laser/scanning mirror motor unit.



① Screws ② Top cover

Figure 4-405

3) Remove the four screws then the scanning mirror motor unit.



① Screws ② Scanning mirror motor unit

Figure 4-406

Notes:
1. Do not remove the dust-proofing cover over the mirror chamber (on the top of the scanning mirror motor unit).
2. Be careful not to touch or to allow dust to get on the lens or other optical surfaces.

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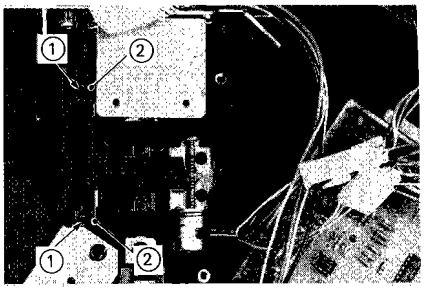
5. Removing the AF Motor and AF Sensor PCB

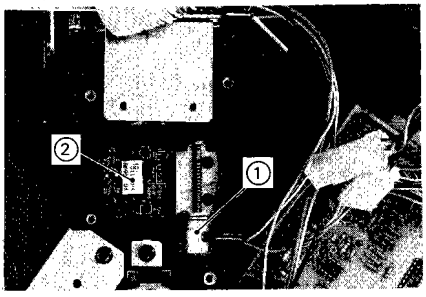
1) Remove the two screws, and remove the two leaf springs.



① Screws ② Leaf spring

Figure 4-407

2) Remove the AF lens.
3) Remove the two screws, and remove the AF motor.
4) Remove the two screws, and remove the AF sensor PCB.



① AF motor ② AF sensor PCB

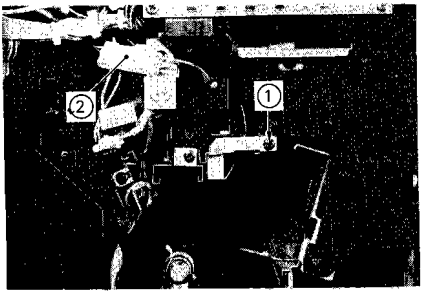
Figure 4-408

Note:
Take care not to trap the harness from the AF sensor PCB when mounting the AF motor.

B. Preconditioning Exposure System

1. Removing the Preconditioning Exposure Lamp

1) Remove the inner front cover.
2) Remove the photosensitive drum.
3) Remove the screw and connector, then pull out the preconditioning exposure lamp.



① Screw ② Connector

Figure 4-409

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C. Laser Reflection Mirror

1. Adjusting the Laser Reflection Mirror Position

The position of the laser reflection mirror should be adjusted whenever the laser/scanning mirror motor unit is replaced or a BD detection error occurs.

1) Open the front door; keep the power ON.
2) Turn the power switch OFF and ON.
3) Press the keys as follows to set the service mode for BD adjustment:

[*][4][*][*][1][1][0][*][1][*]

The front door is open; 'E100' will be indicated even if the reflection mirror is correctly adjusted.

4) Insert the actuating tool into the door switch unit.
5) If E100 is displayed on the display PCB, press the top and bottom ends of the laser reflection mirror mount to determine whether the E100 indication goes OFF.

Note:
If the E100 indication remains no matter which side of the laser reflection mirror mount is pressed, the problem may not be the fault of the optical path. In this case, do not adjust the laser reflection mirror position.

When the E100 indication goes OFF, 'P__1' is displayed.

6) If the E100 indication goes OFF in step 5), adjust the laser reflection mirror position as follows:
7) Loosen the two screws shown in Figure 4-410.
8) Turn the adjusting screw until the E100 indication goes OFF.

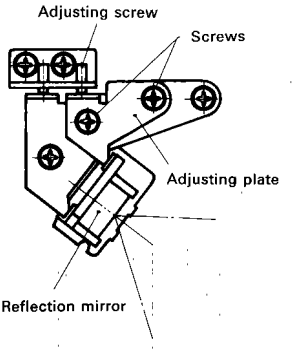

Figure 4-410

9) Turn the adjusting screw counterclockwise to determine the position at which the E100 indication goes ON again.
10) Slowly turn the adjusting screw clockwise until the E100 indication goes OFF again. Turn the adjusting screw clockwise 30°.
11) Tighten the two screws to fix the adjusting plate.

2. Replacing the Optical Fiber

Do not remove the mount when replacing the optical fiber; remove the cover over the optical unit, and remove the optical fiber only.

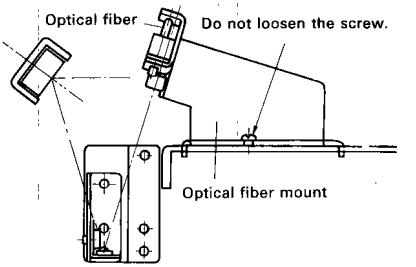

Figure 4-411

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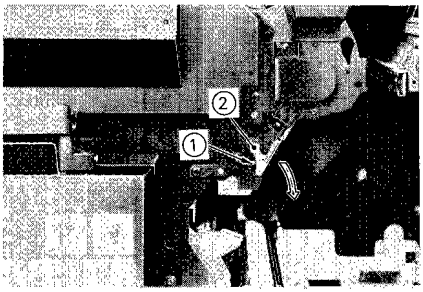
V. ELECTROSTATIC IMAGE FORMATION SYSTEM

A. Photosensitive Drum

1. Disassembly

Before beginning work, be sure to check that the roller is at its home position.
If the developing unit faces the drum, the drum may be damaged.

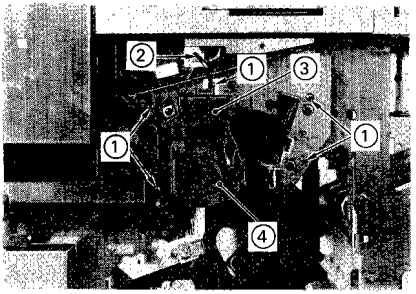
1) Remove the inner front cover.
2) Remove the transfer drum unit.
3) Remove the drum cleaning unit.
4) Remove the toner receptacle.
5) Remove the screw and connector, and remove the primary corona unit.
6) Remove the screw, pull the lever toward the front, and shift the side cleaning unit to the right.



① Screw ② Lever

Figure 4-500

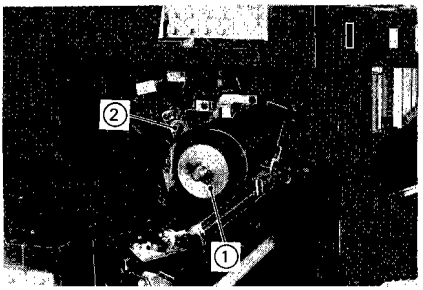
7) Remove the four screws, and remove the drum centering plate.



① Screws
② Connector
③ Primary corona unit
④ Drum centering plate

Figure 4-501

8) Pull out the potential sensor.
9) Remove the drum fixing ring (boss at inside).



① Ring ② Potential sensor

Figure 4-502

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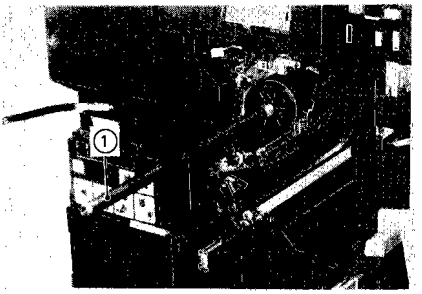
10) Connect the extension shaft to the drum shaft.



① Extension shaft

Figure 4-503

11) Slowly pull out the photosensitive drum.

Notes:
1. When pulling out the photosensitive drum, the inside flange of the drum may touch the pin attached on the front of the drum shaft. Avoid the pin by turning the drum and pulling it out carefully.
2. Do not lift the extension shaft, otherwise, it may disconnect from the drum shaft.
3. Because the photosensitve drum is vulnerable to strong light, insensitive or black areas may be caused when the drum is exposed to strong light for a long time. To avoid it, wrap the removed photosensitive drum with a black sheet (if unavailable, use fresh copy paper instead) and store the drum in a dark place.

2. Cleaning

If the surface of the photosensitive drum is dirty, clean it with a flannel cloth sprinkled with toner. (Do not use the lint-free paper, lint-free or otherwise.)

Never dry-wipe the drum or clean it using solvent.
Also, never use drum-cleaning powder.

3. Points to Note in Installing the Photosensitive Drum

When installing a new photosensitive drum, be sure to apply a lubricant (TKN-0484) on the drum cleaning blade to prevent bending of the blade.

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B. Corona Units

1. Outline

The machine has seven corona units. All corona wires used for these units are 0.06 mm in diameter.

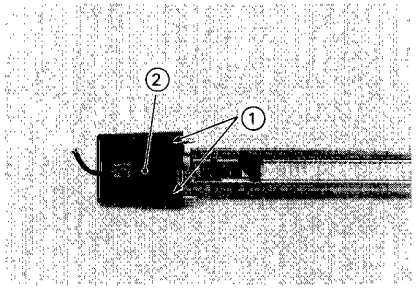
Although the grid wires used in the primary corona unit are 0.1 mm in diameter and not gold plated, standard gold-plated grid wires can be used for field servicing.

2. Removing the Wire Cleaner for the Primary Corona Unit

1) Press the following keys to enter the service mode.

[*][4][*][*][1][2][2][*]

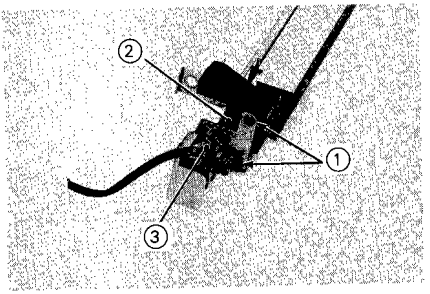
2) Press the [1] and [*] keys to move the wire cleaner to the rear of the primary corona unit.
3) Remove the primary corona unit.
4) Remove the two screws, and remove the grip at the front.



① Screw ② Grip

Figure 4-504

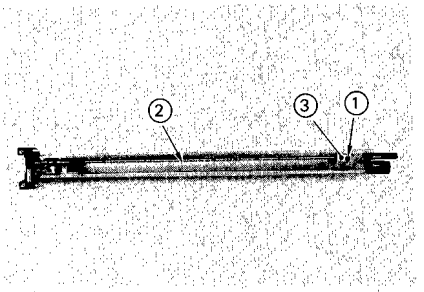
5) Remove the two screws, and remove the motor and collar.



① Screws ③ Collar
② Motor

Figure 4-505

6) Remove the screw, and remove the screw stop plate.



① Screw ③ Screw stop plate
② Screw

Figure 4-506

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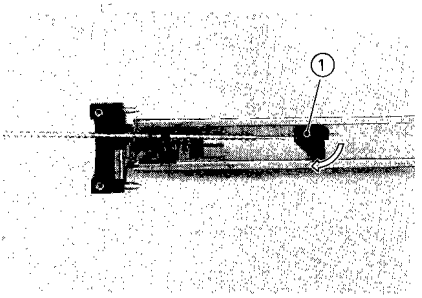
7) Turn the screw by hand, and pull it out of the wire cleaner.



① Wire cleaner

Figure 4-507

8) Lower the primary corona wire with care so that it will not come into contact with the wire cleaner, and turn the wire cleaner 90° to remove.

Note:
Mount the wire cleaner on the primary corona unit; thereafter, turn the screw to move the wire cleaner toward the rear of the primary corona unit. Next, mount the primary corona unit on the copying machine, and press the following keys to enter the service mode.

✻ 4 ✻ ✻ 1 2 3 ✻

Press the 1 and ✻ keys to move the wire cleaner to the front of the primary corona unit.

3. Installing and Tensioning the Corona Wires

The basic procedure to install and tension corona wires (not grid wires) is the same for all corona units. The following procedure for the primary corona wire is representative.

1) Remove the front and rear block covers.
2) Unwind about 5 cm of 0.06 mm corona wire, and form a 2-mm loop at the end.

Remarks:
The loop may be formed easily by winding the wire once around a hex key, and then twisting the wire by turning the hex key three or four times.

3) Cut off the excess corona wire at the twisted end.
4) Hook the loop onto the stud.

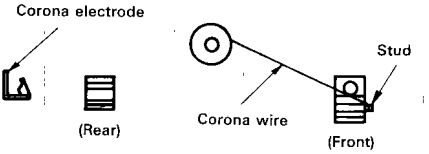


Figure 4-508

5) Place the corona wire into the V-groove of the corona wire positioner at the rear of the corona unit, hook the corona wire tensioning spring on the corona wire, and twist the spring.

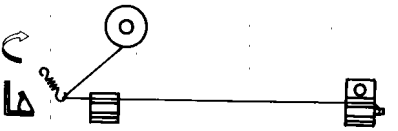


Figure 4-509

6) Cut off the excess corona wire.
7) Grasp the end of the corona wire tensioning spring with tweezers, and hook it onto the corona electrode.

Figure 4-510

Note:
Check the following:
- **The corona wires must be free of kinks, bends, and peeling plating.**
- **The corona wire should be in the V-groove of the wire positioner.**

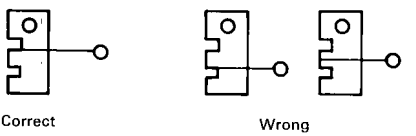


Figure 4-511

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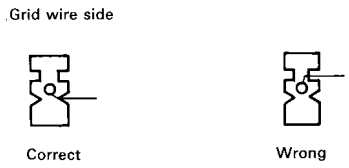
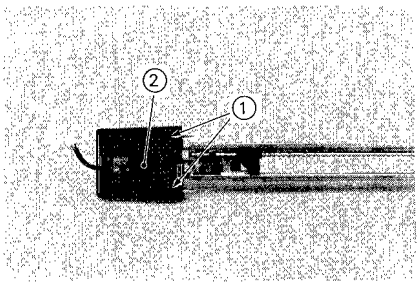


Figure 4-512 Primary corona wire

8) Attach the cover to the front and rear blocks.
9) Wipe the primary corona wire with lint-free paper moistened with alcohol.

4. Stringing the Primary Corona Grid Wire

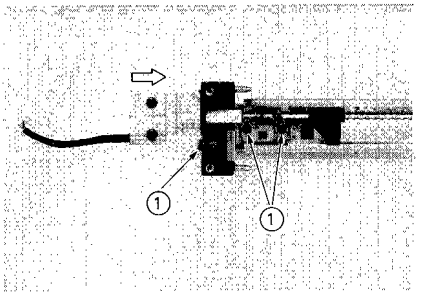
1) Remove the two screws and take off the front knob.



① Screws ② Front knob

Figure 4-513

2) Remove the two screws, and remove the side seal plate.
3) Remove the rear block cover.
4) Remove the lid of the electrode plate.
5) Loosen the three screws securing the front block, slide the front block as shown in Figure 4-514, and fasten the screws temporarily.



① Screws

Figure 4-514

6) Unwind about 5 cm of 0.1 mm corona wire (Y81-0162-000), and form a 2 mm loop at the end.

Remarks:
The loop can be formed as described earlier.

7) Cut off the excess wire at the twisted end leaving 1 mm or less.
8) Hook the loop onto the electrode plate and string the wire in the order shown in Figure 4-515.
9) After 22 wires have been strung, hook the end of the corona wire onto the stud and wind it around the screw for fixing.
10) Cut off the excess corona wire leaving 1 mm or less.
11) Again loosen the screws fastened temporarily in step 3), and tighten the grid wire by sliding the front block in the direction opposite to that shown in Figure 4-514.
12) Check the following:
- The grid wires must be free of kinks, bends, and peeling plating.
- The wires should be spaced uniformly. (The wires should be in the grooves in the block.)

13) Attach the rear block cover, electrode lid, and knob.
14) Dry-wipe the grid wires.

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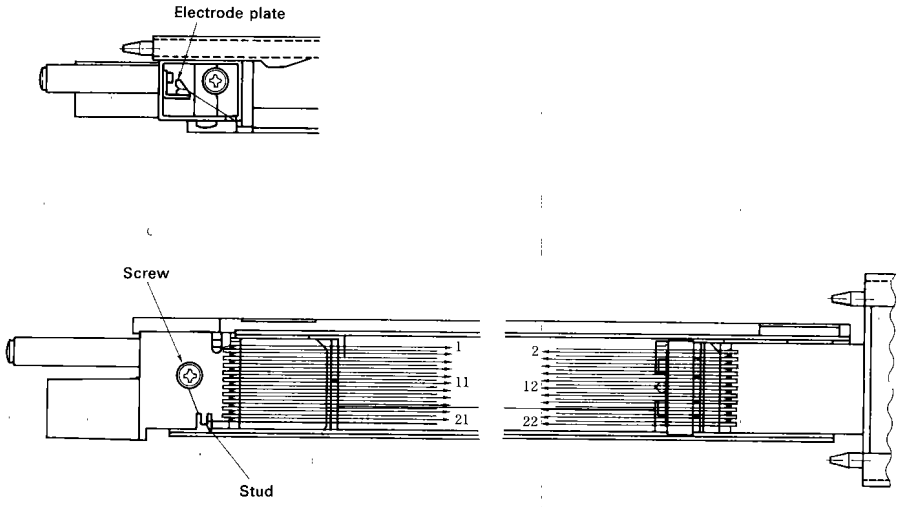

Figure 4-515

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5. Adjusting the Height of the Corona Wire

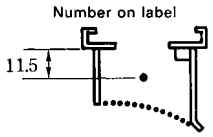
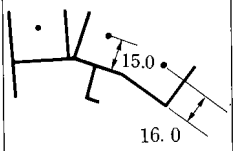
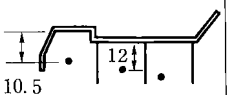
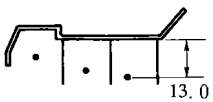
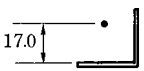
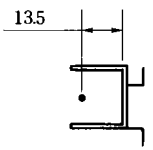
Corona	Corona wire height (mm)	Adjustment range
Primary corona		+1 −2
Transfer corona		±1
Inner static charge eliminating corona		+0 −2
Outer static charge eliminating corona		±2
Separation corona		±1
Pre-fixing corona		+0 −1
Pre-cleaning corona		±2

Figure 4-516

Remarks:
The height of each corona wire can be adjusted by turning the screw at the rear of the corona unit. One turn of the screw changes the wire height approximately 0.7 mm. A full turn of the screw leads to a change of 0.5 mm for the transfer and static charge eliminating corona unit wires.

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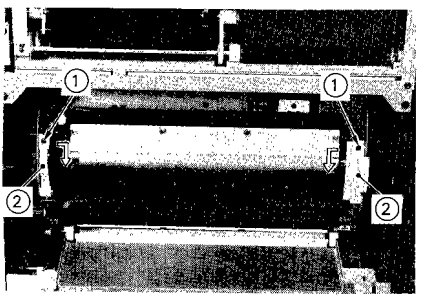
VI. DEVELOPING SYSTEM

A. Developing Assembly

The structure and installation procedure given below is the same for all developing units in the machine.

1. Removing a Developing Unit

1) Turn the turret and select the developing unit to be removed.
2) Remove the two screws.
3) While slightly pressing the developing unit, remove the assembly by slightly swinging the developing unit positioning lever backward.

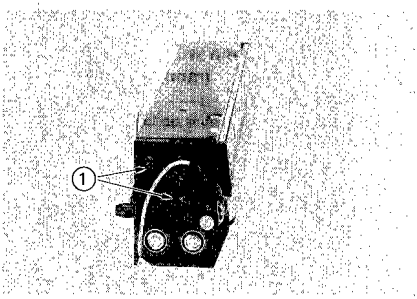


① Screw ② Positioning lever

Figure 4-600

4) Be careful not to spill the toner when removing the developing unit.

Note:
Be careful not to touch or allow the toner to get on the fiber optic lens array when removing the developing unit.



① Fiber optic lens array

Figure 4-601

5) When turning the developing unit, turn it only in the direction as shown in Figure 4-602. If the unit is turned in the other direction, the toner spills from the toner supply outlet.

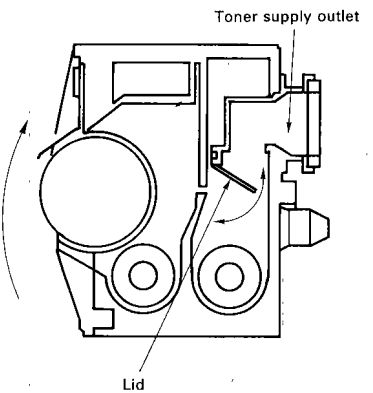


Figure 4-602

Note:
To empty the four developing assemblies in succession, remove each assembly emptied from the turret, and go onto the next assemlby.
To empty a single specific developing assem-bly, remove all other assemblies in advance to prevent mixing of developer.

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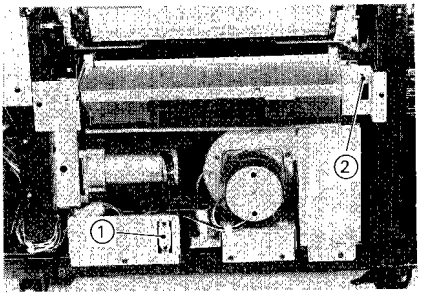
2. Replacing Starter Developer

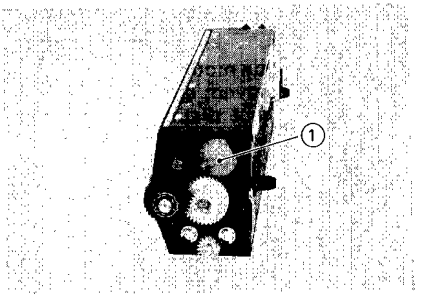
1) Turn the turret by hand so that the developing unit to be emptied is at the bottom.
2) Select the service mode.
(☒4☒)
3) Select address P142 (☒142☒) and press keys 1☒
4) Press SW5, located under the turret. Check that the developing cylinder of the developing unit in question is rotating.
5) Push down the toner catcher lever. The toner in the developing unit is collected.



① SW5 ② Toner catcher lever

Figure 4-603

6) When most of the toner in the developing unit has been removed, return the toner catcher lever to its original position.
7) Turn SW5 OFF.
8) After one minute, gently remove the developing unit without tilting it.
9) Remove the cap from the developing unit while holding the developing unit horizontal.



① Cap

Figure 4-604

10) Stand the developing unit upright and remove the remaining toner.
11) Attach the cap to the developing unit.
12) Install the developing unit in the machine.
13) Turn the turret by hand to position the developing unit at the bottom again.
14) Turn SW5 ON.
15) Push down the toner catcher lever.
16) When all toner in the developing unit has been removed, return the toner catcher lever to its original position; wait 30 seconds.
17) Press the C key twice.
18) Remove the developing unit from the machine.
19) Put new starter developer in the developing unit.

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3. Disassembling the Developing Assembly

Once the blade mount of the developing assembly is removed, it will be difficult to ensure the correct distance between the blade and the cylinder; further, removal of the electrode positioning plate puts the polarity of the developing cylinder out of order, leading to faulty images. The developing assembly, therefore, should never be disassembled in the field.

4. Points to Note in Setting the Developing Assemblies

Before setting the developing assemblies on the turret, check that gears A and B shown in Figure 4-605 are engaged; otherwise, the developing cylinder comes into contact with the photosensitive drum, resulting in damage to the latter.

a. Checking the Gears

1) Set the developing assembly on the turret.
2) Keep the lock arm of the developing assembly free, turn gears C and D into the direction of the arrow (Figure 4-618); do not force the developing assembly in excess when turning gears C and D.
3) Fix the lock arm in place.

Note:
The lock arm will not close fully when gears A and B are not engaged with A in Figure 4-605 being 0.5 or less; avoid force.

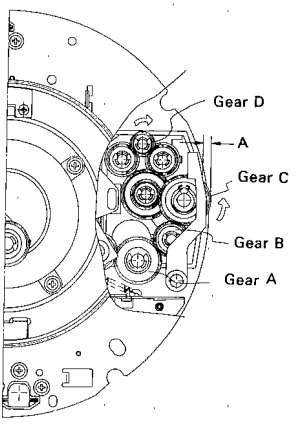

Figure 4-605

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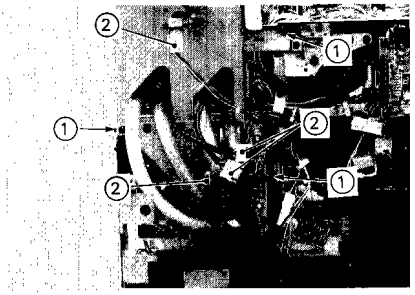
B. Hopper Unit

1. Removing the Hopper

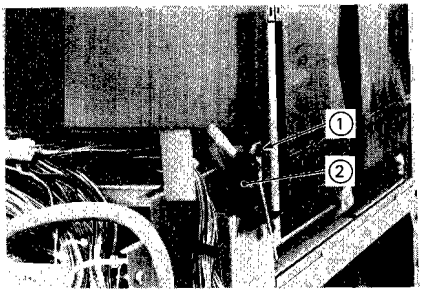
1) Remove the front and rear covers and the front left door of the hopper.
2) Slide the printer top cover to the right.
3) Remove the three screws and four connectors.



① Screws ② Connectors

Figure 4-606

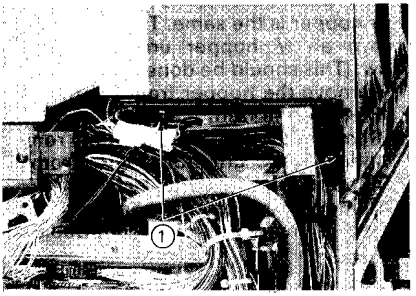
4) Remove the screw then the left panel switch mount.



① Screws ② Left panel switch mount

Figure 4-607

5) Remove the two screws.



① Screws

Figure 4-608

6) Pull the hopper unit forward and remove it.

Note:
Take care not to damage the harness when pulling it out.

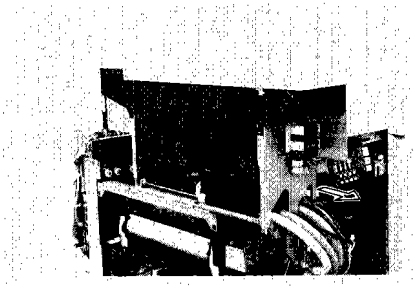


Figure 4-609

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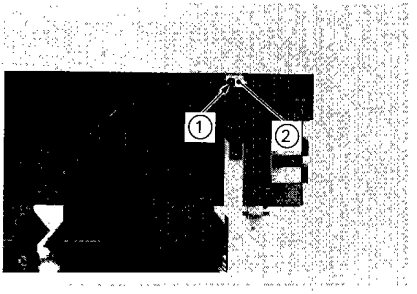
2. Removing a Color Toner Hopper Unit

The procedure to remove any color toner hopper is the same. The procedure to remove an M hopper unit is explained below. (This should be done in a workshop.)

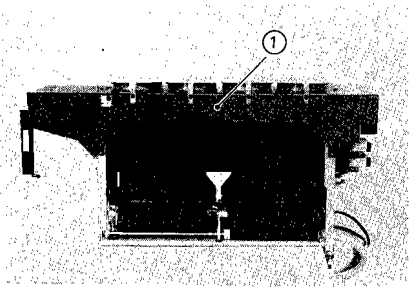
1) Remove the hopper from the machine.
2) Remove the right cover of the hopper.
3) Remove the two screws, and remove the belt and grounding wire from the hopper door.
4) Remove the two screws and two hinges and remove the hopper unit door.



① Screw ② Hinge

Figure 4-610

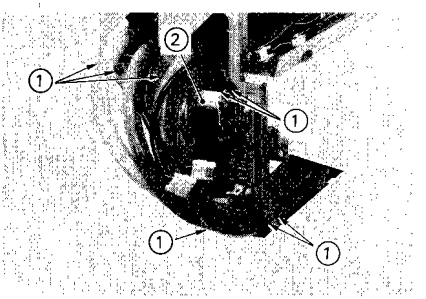
5) Remove ten screws then the hopper top cover.



① Top cover

Figure 4-611

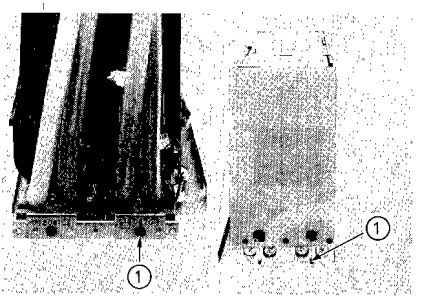
6) Put paper into the toner supply outlet of the developing unit to prevent toner from falling out.
7) Remove the environment sensor; remove the eight screws, and remove the hopper unit front cover.



① Screws ② Environment sensor

Figure 4-612

8) Remove the two screws and slide the M and BK hopper units to the right.



① Screws

Figure 4-613

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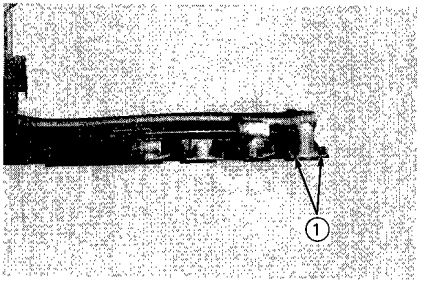
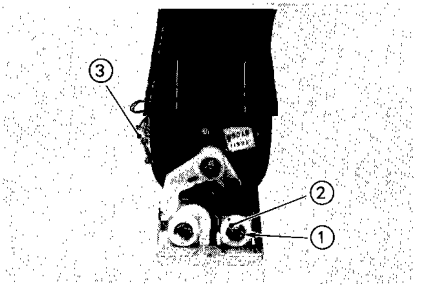
9) Remove the screw.



① Screws

Figure 4-614

10) Remove the two screws securing the M hopper unit from under the bottom plate.
11) Disconnect the connector from the toner sensor; remove the screw, and remove the grounding wire.
12) Remove the E-ring, coupling, pin, and bushing, then remove the M hopper unit.



① E-ring
② Coupling
③ Connector

Figure 4-615

C. Turret Assembly

1. Construction

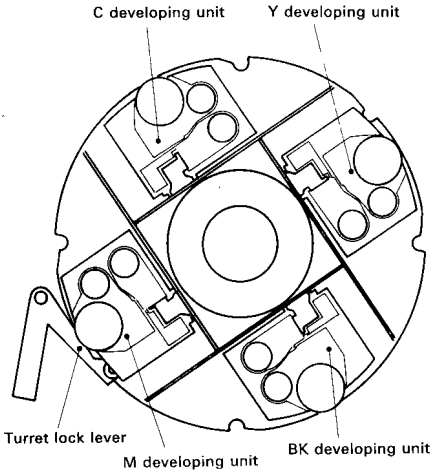
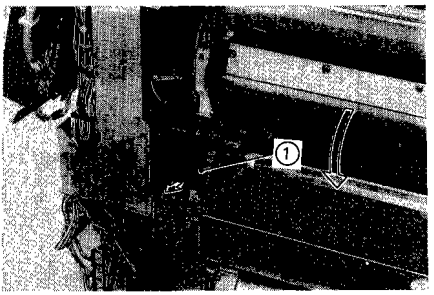


Figure 4-616 Roller home position

2. Turret Rotation Procedure

Pull the turret lock lever, then turn the roller while pressing it down.



① Turret lock lever

Figure 4-617

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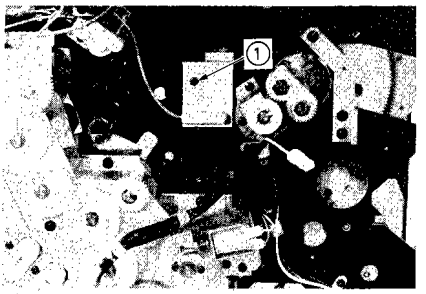
3. Removing the Roller Unit

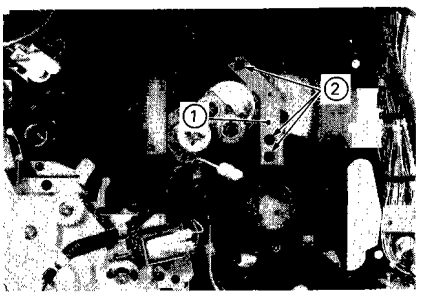
1) Remove the photosensitive drum.
2) Remove all developing units.
3) Remove the hopper unit.
4) Remove the turret lock release unit.
5) Remove the drum motor.
6) Remove the mounting screw then the developing bias unit.



① Screw

Figure 4-618

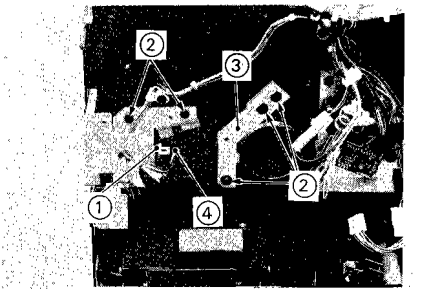
7) Remove the toner catcher unit.
8) Remove the three mounting screws then the turret positioning plate.



① Turret positioning plate ② Screws

Figure 4-619

9) Remove the two screws and connector, and remove the turret home position sensor.
10) Remove the three mounting screws then the turret positioning plate.



① Turret home position sensor ③ Turret positioning plate
② Screws ④ Connector

Figure 4-620

11) Gently remove the turret assembly.

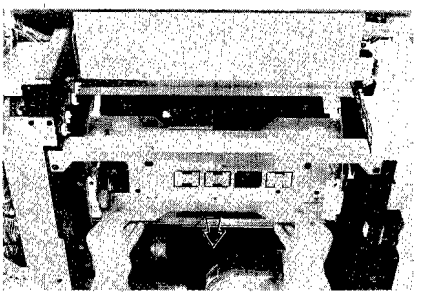


Figure 4-621

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4. Installing the Turret

To install the turret, reverse the steps used for its removal; keep, however, the following in mind.

a. Make sure that the turret positioning plate (front) is securely in the groove of the turret.

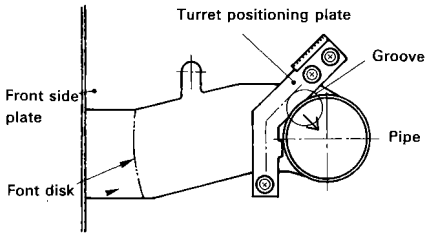

Figure 4-622

b. Engage the boss on the turret positioning plate (rear) with the cut-out on the pipe, and screw it in place.

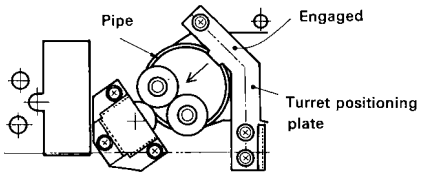

Figure 4-623

5. Replacing the Turret

a. Before Replacement

Keep the turret positioning tool on hand.

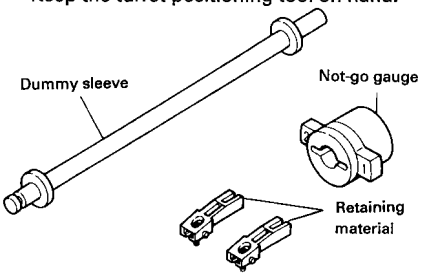

Figure 4-624 Turret Positioning Tool (FY9-3001-000)

b. Replacement

1) Draw out the developer from each developing assembly.
2) Detach the turret assembly.
3) Attach the new turret assembly.
4) Attach the developing assemblies to the turret assembly; at this time, however,
   - do not pour developer;
   - keep the photosensitive drum, primary corona assembly, cleaner assembly, and transfer drum detached; and
   - keep the side cleaner assembly away from the photosensitive drum.
5) Check that the developing sleeve is properly kept from the four developing assemblies using the not-go gauge (see steps 1 through 3); otherwise, adjust the position of the developing assembly base of the turret assembly according to the instructions that follow.

   ①Insert the not-go gauge into the drum shaft, and attach the drum positioning plate; see Figure 4-625.

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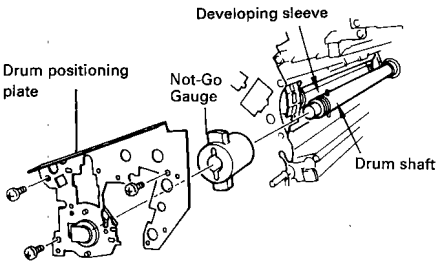

Figure 4-625

②Butt the not-go gauge against the rear of the copier; then, rotate the not-go gauge counterclockwise slowly. At the time, make sure that boss 1 on the not-go gauge moves past the edge, but boss 2 does not (Figure 4-626); do not, however, force the not-go gauge when rotating it. Make sure that the edge of the developing sleeve is free of developer.

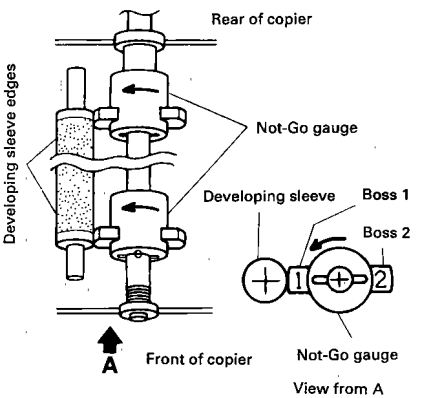

Figure 4-626 Using the Not-Go Gauge

③Butt the not-go gauge against the drum shaft pin at the front of the copier; then, make the checks indicated in step 2 of 5); see Figure 4-626.

6) If the results of the foregoing checks are good, detach the not-go gauge.
7) Attach the unit.
8) Pour new developer into each developing assembly, and adjust the toner density sensor circuit.
9) Make test copies (particularly, density difference between image rear and front); at the time, make sure that the images are free of faults.

c. Adjusting the Developing Assembly Base

If you have replaced the turret and found that the distance between the developing sleeve and the not-go gauge is not as specified, adjust the developing assembly base; adjust both front and rear sides in the same way, and keep the following in mind:

- If only the front or the rear side is not as specified, adjust the respective side only.
- If both the front and the rear sides are not as specified, adjust both sides one at a time.

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Adjustment

1) Detach the developing assembly fixing arm.
2) Loosen screw A used to secure the developing assembly base and screw B used to secure the stop member; then, move the stop member as shown in Figure 4-627, and fix it in place with screw B.

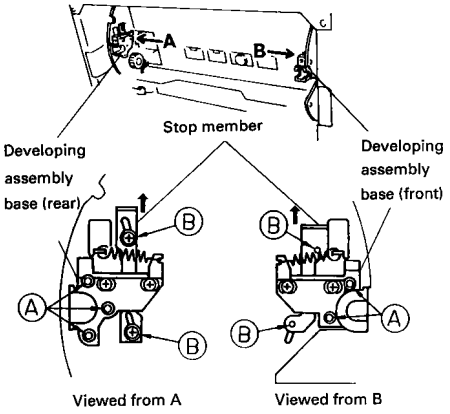

Figure 4-627

3) Fix the dummy sleeve in place on the developing assembly base using the retaining member (jig) instead of the developing assembly fixing arm; see Figure 4-628.

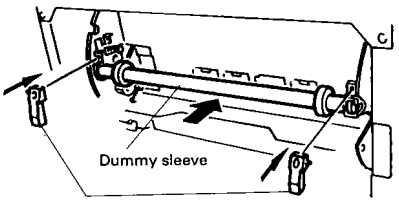

Figure 4-628

4) To adjust the front side, detach the hopper assembly front cover and the toner density sensor PCB.
To adjust the rear, detach the drum motor assembly and the developing bias assembly.

5) Move the dummy sleeve to the point of development, and butt it against boss 1 of the not-go gauge previously set; see Figure 4-629.

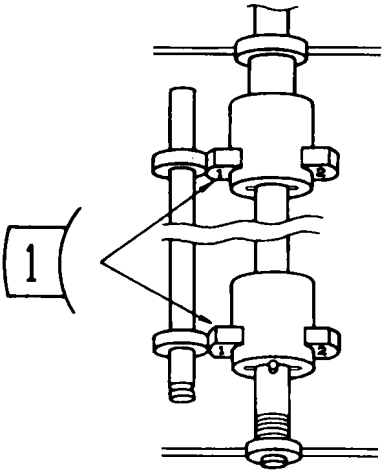

Figure 4-629

6) Detach the dummy sleeve and the retaining member.
7) Move the stop member in the direction of the arrow (Figure 4-630) until it stops, and fix it in position using screw B.

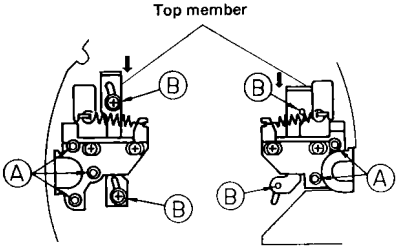

Figure 4-630

8) Attach the developing assembly fixing arm.
9) Make the checks indicated in step 5); if the results are good, paint-lock screw A and screw B.

d. Points to Note

The turret must be replaced on a unit basis; do not disassemble the unit to replace its component parts.

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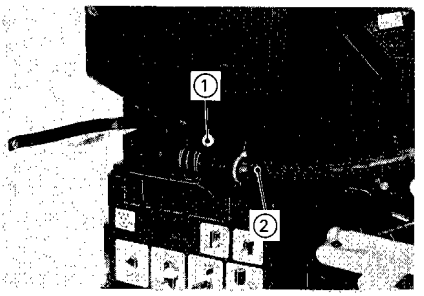
VII. DRUM CLEANING SYSTEM

A. Drum Cleaning Unit

1. Removing the Drum Cleaning Unit

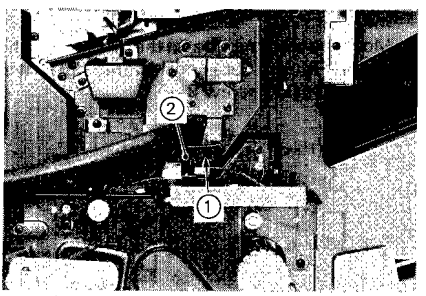
1) Remove the knurled screw then the hose.



① Nurled screw ② Hose

Figure 4-700

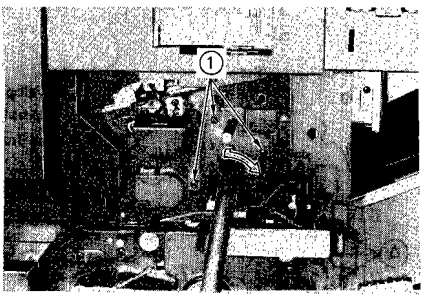
2) Remove the display unit cover.
3) Remove the screw, and remove the pre-cleaning corona unit.



① Screw ② Pre-cleaning corona unit

Figure 4-701

4) Push the toner catch unit along the rail of the pre-cleaning corona unit.
5) Remove the three mounting screws, then pull the drum cleaning unit handle forward.
6) Move the drum cleaning unit handle as shown in Figure 4-702.



① Screws ② Drum cleaning unit handle

Figure 4-702

7) Grasp the cleaner handle and pull the drum cleaning unit forward.

Note:
Because there is no drum cleaning assembly stop, be careful not to pull the cleaning unit so far that it falls out.

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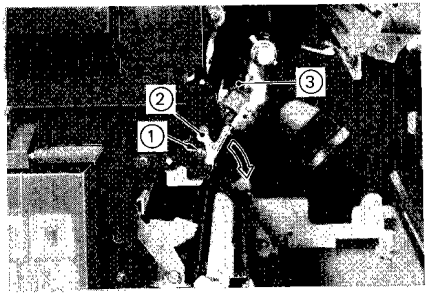
B. Side Cleaner Unit

1. Removing the Side Cleaner Unit

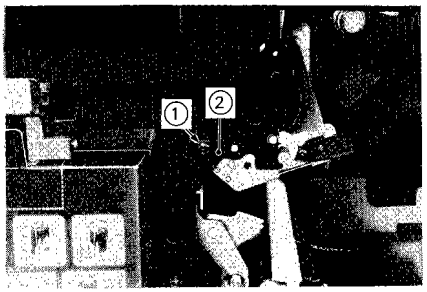
1) Remove the screw, pull the lever toward the front, and shift the toner trap unit to the right.



① Screw ③ Toner trap unit
② Lever

Figure 4-709

2) Remove the photosensitive drum.
3) Remove the screw, and remove the positioning plate.

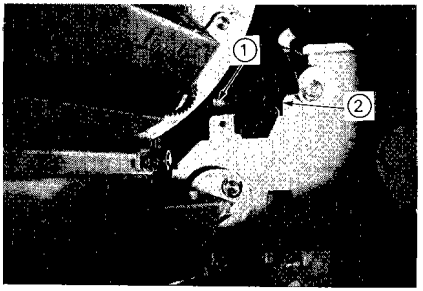


① Screw ② Positioning plate

Figure 4-710

4) Hold the rear of the side cleaner unit, and remove it.

Be sure to hook the side cleaner unit on the positioning boss on the rear plate.

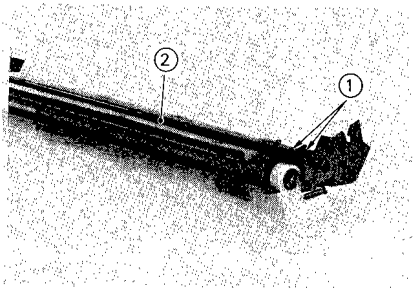


① Positioning boss ② Lever shaft slot

Figure 4-711

2. Removing the Scraper

1) Remove the two E-rings, and pull out the lever shaft.



① E-ring ② Lever shaft

Figure 4-712

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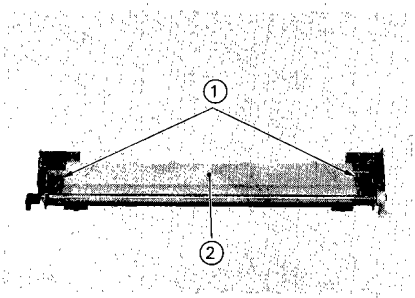
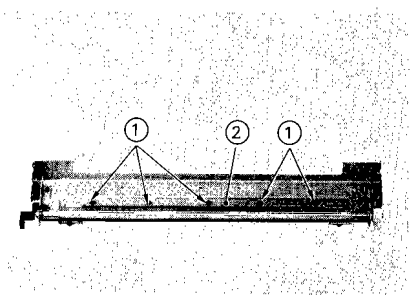
2) Remove the two screws, and remove the cover.



① Screws ② Cover

Figure 4-713

3) Remove the five screws, and remove the scraper stop plate and scraper.



① Screws ② Scraper stop plate

Figure 4-714

3. Scraper Position

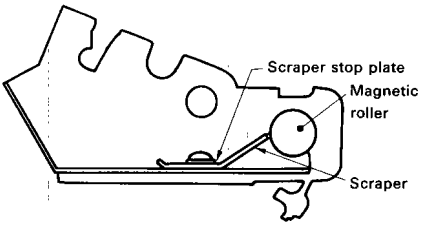


Figure 4-715

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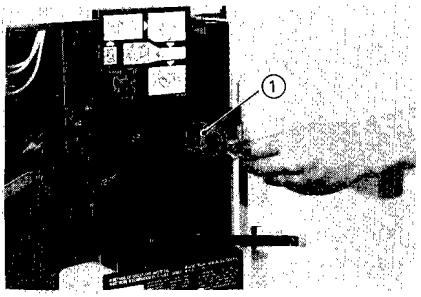
VIII. FIXING SYSTEM

A. Fixing Unit

1. Removing the Fixing Unit

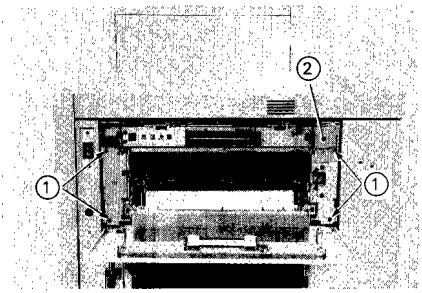
1) Remove the screw then the knob.



① Knob

Figure 4-800

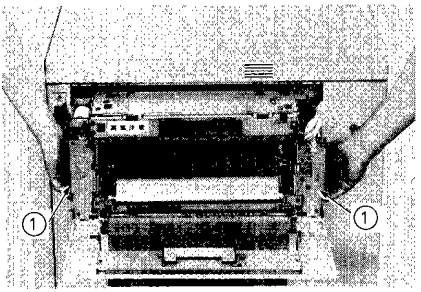
2) Open the paper delivery unit cover.
3) Remove the four mounting screws then the connector cover.
4) Disconnect the two connectors.



① Screws ② Connector cover

Figure 4-801

5) Pull out the fixing unit, holding it by the handles, and remove it.

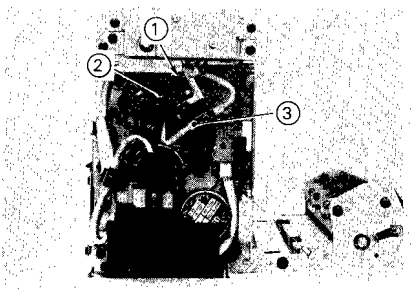


① Handles

Figure 4-802

2. Removing the Upper Fixing Heater/Roller

1) Remove the fixing unit from the machine.
2) Remove the upper cleaning belt unit.
3) Remove the faston (front) of the upper heater.
4) Remove the screw, and remove the upper heater support plate (front).



① Screw
② Upper heater support plate (front)
③ Faston (front)

Figure 4-803

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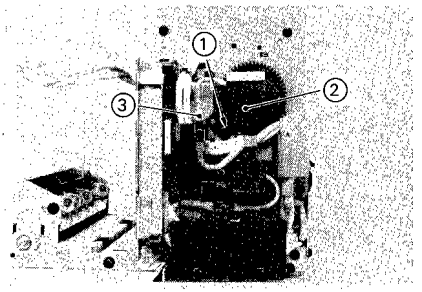
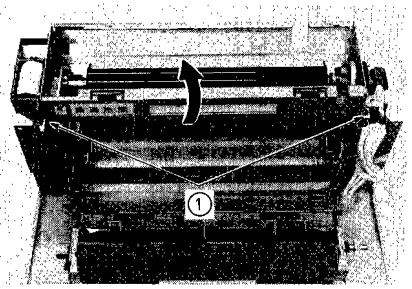
5) Remove the faston (rear) of the upper heater.
6) Remove the screw, remove the upper heater support plate (rear), and remove the upper heater.



① Screw
② Upper heater support plate (rear)
③ Faston (rear)

Figure 4-804

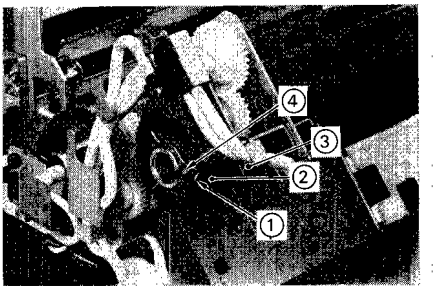
7) Remove the two mounting screws, then open the upper part of the fixing assembly.



① Screws

Figure 4-805

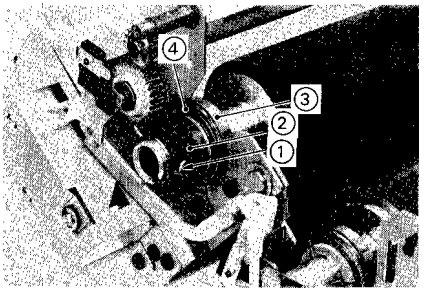
8) Remove the C-ring then the gear, ball bearing, and the heat insulation bushing (rear side).



① C-ring
② Gear
③ Ball bearing
④ Heat insulation bushing

Figure 4-806

9) Remove the C-ring then the gear, ball bearing, and the heat insulation bushing (front side).



① C-ring
② Gear
③ Ball bearing
④ Heat insulation bushing

Figure 4-807

10) Remove the upper roller.

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3. Installing the Upper Fixing Heater/Roller

Installing the upper fixing heater and upper roller is the reverse of removal. Note the following:

- Handling the upper fixing heater
  Do not touch the surface of the upper fixing heater.
- Handling the upper fixing roller
  To prevent the surface of the upper fixing roller from being soiled or scratched, the roller should be wrapped in copy paper.
- Take care not to damage the thermoswitch when mounting the upper roller. The upper fixing heater and roller can be installed in either direction.
- Mount the upper roller so that the side of the shaft with a D-cut should be toward the front.
- Mount it so that the tooth side of the gear is toward the front as shown in Figure 4-808.

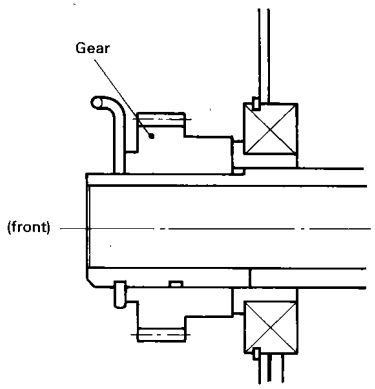
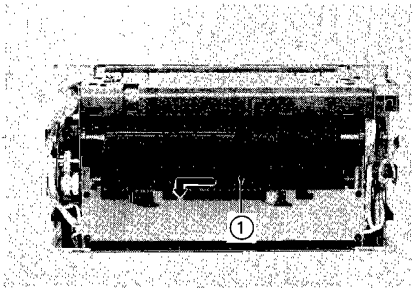


Figure 4-808

4. Removing the Lower Fixing Heater/Roller

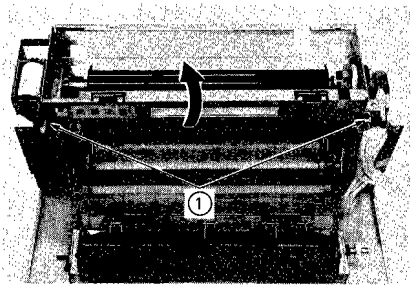
1) Remove the fixing unit from the machine.
2) Remove the paper guide plate.



① Paper guide plate

Figure 4-809

3) Remove the upper cleaning belt unit.
4) Remove the two mounting screws, then open the upper part of the fixing unit.



① Screws

Figure 4-810

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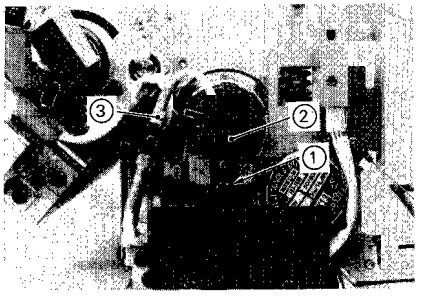
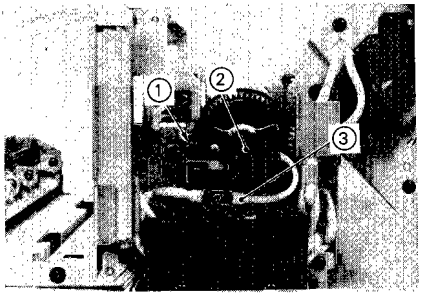
5) Remove the faston (front) of the lower heater.
6) Remove the screw, and remove the lower heater support plate.



① Screw
② Heater support plate
③ Faston (front)

Figure 4-811

7) remove the screw, and remove the lower heater support plate and lower heater.



① Screw
② Heater support plate
③ Faston (rear)

Figure 4-812

8) Lift the lower fixing roller from the fixing unit.

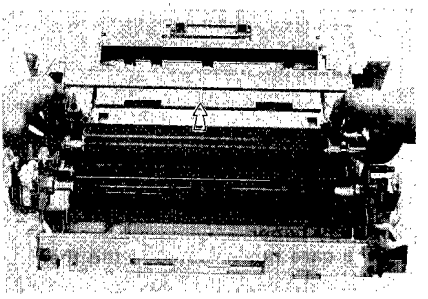
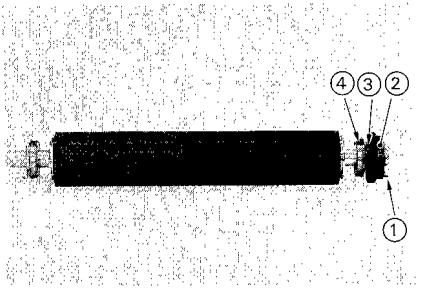


Figure 4-813

9) Remove the C-ring from both ends of the roller, then remove the gear, ball bearing, and heat insulation bushing.



① C-ring
② Gear
③ Ball bearing
④ Heat insulation bushing

Figure 4-814

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5. Installing the Lower Fixing Heater/Roller

Installing the lower fixing heater and roller is the reverse of removal. Note the following:

- Handling the lower fixing heater
  Do not touch the surface of the heater.
- Handling the lower fixing roller
  To prevent the surface of the lower fixing roller from being soiled or scratched, the roller should be wrapped in copy paper.
- Mount the lower roller so that the longer (A) side is toward the front.

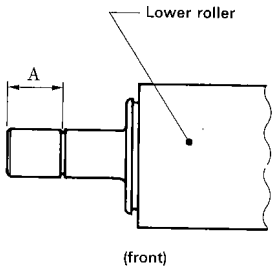


Figure 4-815

- Mount it so that the toothed side is toward the inside of the fixing assembly.

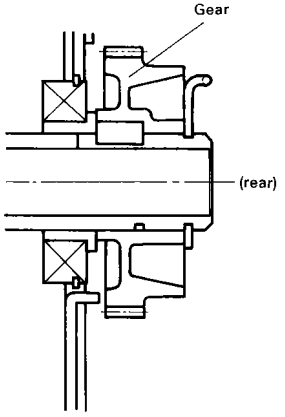


Figure 4-816

6. Removing the Lower Roller Blade

1) Remove the lower cleaning belt unit.
2) Remove the two screws, and remove the blade unit. (Clean the blade in this condition.)

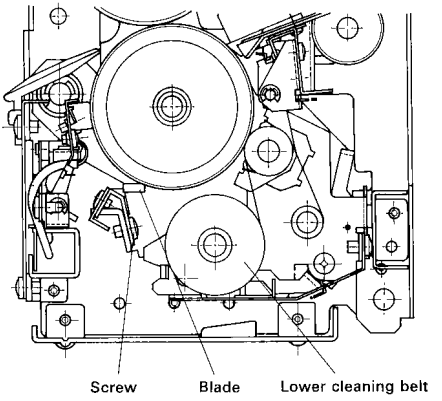
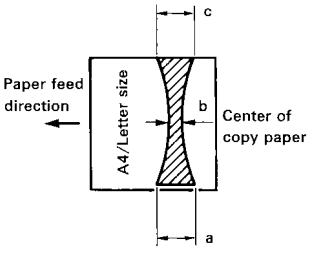


Figure 4-817

7. Adjusting the Roller Pressure (nip width)

Check the nip width. If it is not within the values listed in Table 4-800, adjust the roller pressure by turning the adjustment bolts.



Note:
Values a and c are used when adjusting the nip width at the positions 10 mm from both ends of the copy paper.

Figure 4-818

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Dimensions	Measure nip width only after both rollers have heated up	
b	CLC 500	6.0 $^{+1.0}_{-0.5}$ (mm)
	CLC 550	7.0 ±0.5 (mm)
| a – c |	0.5 mm or less; 0 mm or more	
a – b c – b	1 mm or less 0 mm or more	

Table 4-800

- Measuring the nip width
  If the roller is cool when starting the measurement, switch the power ON, leave it for 15 minutes, make 20 copies, then measure the nip width.

Measuring procedure
1) Insert the A4/letter cassette into the upper cassette slot.
2) Press the following keys to select the service mode:

   ✳ 4 ✳ ✳ 2 1 0 ✳ 1 ✳

3) Press test print key.
   The copy paper is fed from the upper cassette and stops while it is still in the fixing unit, then is delivered.
4) Measure the width of the shiny part of the image made on the copy paper. (See Figure 4-818.)

8. Thermistor Position

Check that the sensing surface of the thermistor makes uniform contact with the surface of the roller.

Remarks:
The thermistor position need not be adjusted. If the sensing surface of the thermistor does not contact the roller surface uniformly, check whether the mounting spring is deformed.

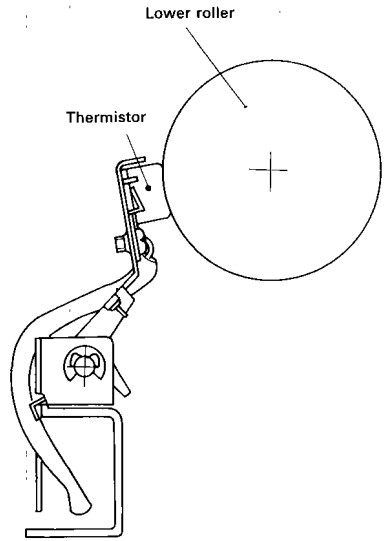

Figure 4-819

9. Thermal Fuse Position

The thermal fuse is rated for 150°C, and its position need not be adjusted.

Note:
Be sure to use a spring washer in screwing the thermal fuse in place.

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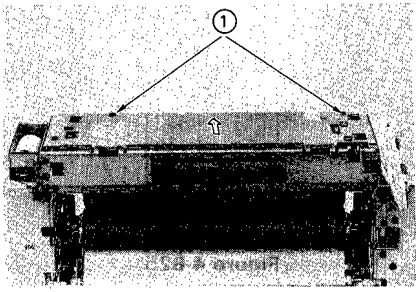
B. Fixing Unit Cleaning Unit

Note:
Be sure to replace both upper and lower belts at the same time.

1. Removing the Upper Cleaning Belt Unit

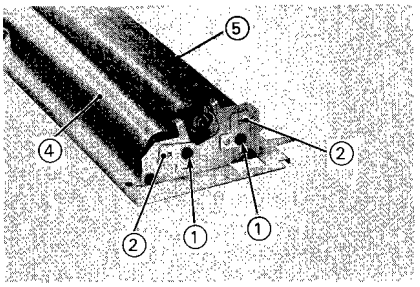
1) Remove the fixing unit from the machine.
2) Remove the two mounting screws.
3) Move the upper cleaning belt into the direction of the arrow (Figure 4-820) to remove.



① Screws

Figure 4-820

4) Remove the two screws, and remove the cleaning belt stop plates.
5) Remove the feeder spindle.
6) Remove the take-up spindle.

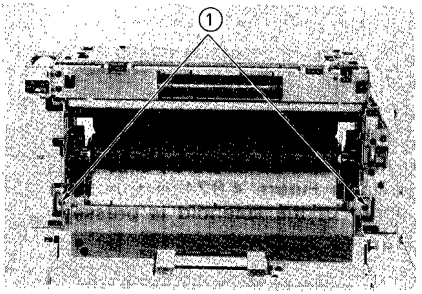


① Screws
② Cleaning belt stop plates
③ Feeder spindle
④ Take-up spindle

Figure 4-821

2. Removing the Lower Cleaning Belt Unit

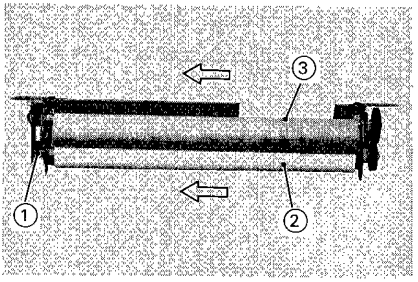
1) Remove the fixing unit from the machine.
2) Remove the two screws, then remove the lower cleaning belt unit.



① Screws

Figure 4-822

3) Remove the feeder spindle while holding it and squeezing the spring.
4) Remove the take-up spindle the same way.



① Spring
② Take-up spindle
③ Feeder spindle

Figure 4-823

3. Mounting the Belt Unit

The belt service unit consists of a feeder spindle shaft, take-up spindle, and a belt. The belt can be mounted by reversing the removal procedure.

Note:
Make sure that the belt winds straight, is taut, and is free of wrinkles.

4. Belt Drive Solenoid Position

Install the solenoid so that the stroke shown in Figure 4-824 is true when the plunger of the solenoid is pressed in by hand.

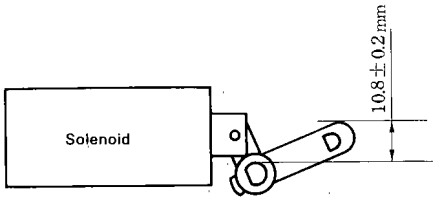
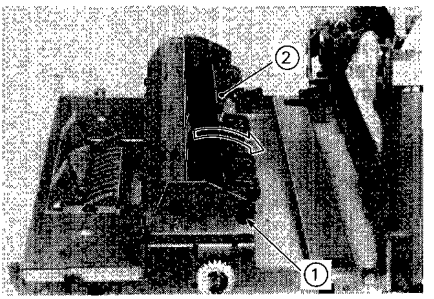


Figure 4-824

C. Delivery Assembly

1. Removing the Lower Roller Separation Claw

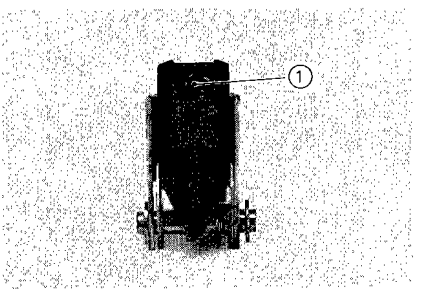
1) Open the delivery unit.
2) Remove the inner cover of the delivery unit.
3) Remove the two screws, and move the delivery lower guide into the direction of the arrow (Figure 4-825).



① Screws ② Delivery lower guide

Figure 4-825

4) Remove the mounting screw then the lower separation claw.



① Screw

Figure 4-826

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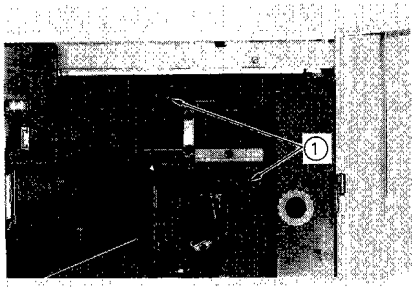
D. Oil Applying Roller Unit

1. Removing the Oil Applying Roller Unit

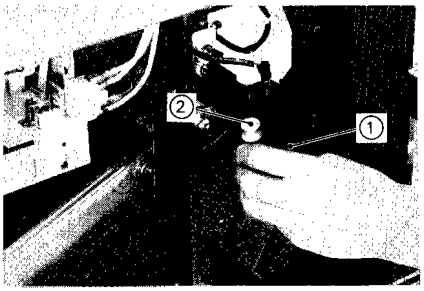
1) Remove the fixing unit.
2) Remove the silicone oil bottle from the bottle mount.
3) Remove the two screws then the bottle mount. When removing the bottle mount, also unplug the connector of the remaining oil level sensor PCB.
The oil drips; so take care.



① Screws

Figure 4-828

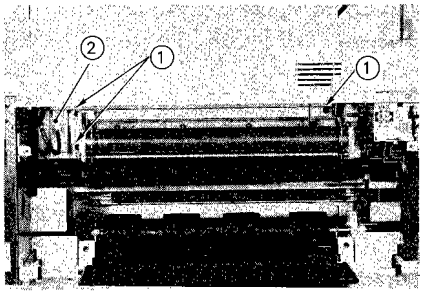
4) Lift the tip of the tube from the oil application unit, and pull off the cap of the tube.



① Tube ② Cap

Figure 4-829

5) Insert the tube of the oil applying unit into the tube hole of the waste bottle mount, and pour out the oil.
6) Put the cap back on the tube.
7) Remove the three screws then the connector.



① Screws ② Connector

Figure 4-830

8) Gently pull the oil applying roller unit forward.

Note:
While pulling the unit forward, be careful not to tilt it so that the oil spills.

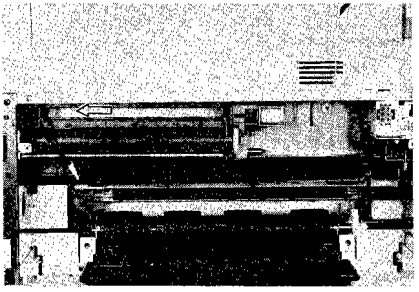


Figure 4-831

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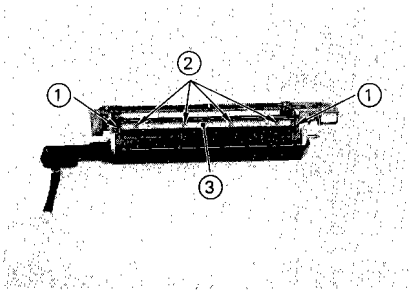
2. Removing the Oil Applying Roller and Blade for CLC 500

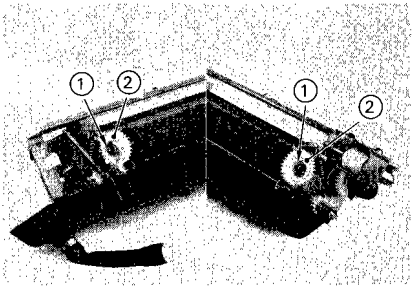
1) Remove the oil applying roller unit from the machine.
2) Remove the two springs.
3) Remove the four screws then the blade.



① Springs ③ Blade
② Screws

Figure 4-832

4) Remove the E-ring then the gear and bushing. When removing the gear, be careful not to lose the pin.



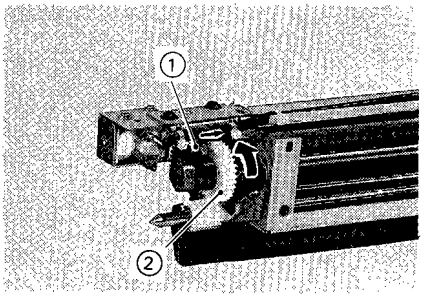
① E-ring ② Gear

Figure 4-833

5) Remove the oil applying roller.

3. Detaching the Oil Applying Roller, Smoothing Roller, and Blade (CLC550)

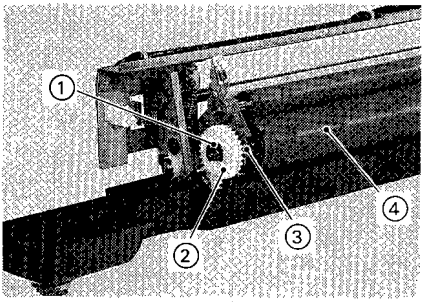
1) Detach the oil applying assembly from the copier.
2) Move the lever of the solenoid to the right, and rotate the gear counterclockwise.



① Lever ② Gear

Figure 4-833

3) Remove the E-ring, and detach the gear and the bushing (both front and rear). (Take care not to drop the pin.)
4) Detach the oil applying roller.



① E-ring ③ Bushing
② Gear ④ Oil applying roller

Figure 4-834

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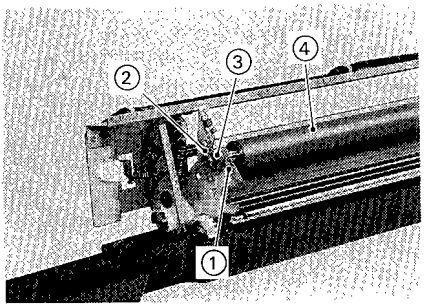
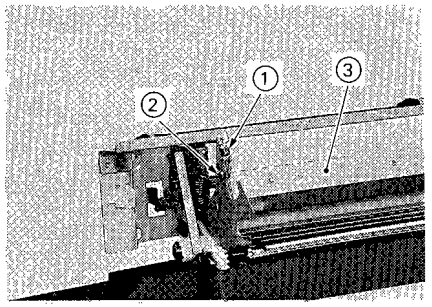
5) Remove the spring and the E-ring, and detach the bushing (both front and rear).
6) Detach the smoothing roller.



① Spring ③ Bushing
② E-ring ④ Smoothing roller

Figure 4-835

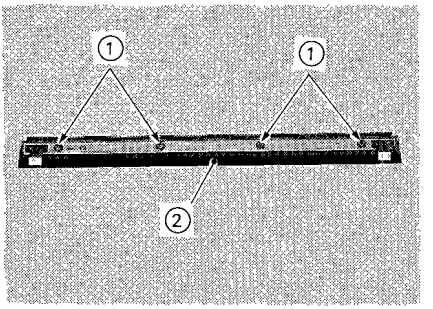
7) Detach the front and rear springs, and remove the stepped screw; then, detach the blade unit.



① Spring ③ Blade unit
② Stepped screw

Figure 4-836

8) Remove the four screws, and detach the blade.



① Screws ② Blade

Figure 4-837

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I. INSTALLATION SUGGESTIONS

It is recommended that a serviceman personally inspect the customer's premises before installing the printer. The location should meet the following requirements:

Note:
The level of ozone generated by the copying machine is not likely to harm the health of those around it. The odor, however, may prove to be unpleasant to some if the machine is used in a badly ventilated room. Ventilate the room for work.

(1) The line voltage should not vary more than ±10% from the voltage marked on the rating plate.
(2) The operating temperature and relative humidity should be within the ranges given in Figure 5-1. Location close to water faucets, humidifiers, air conditioning outlets, and refrigerators should be avoided.

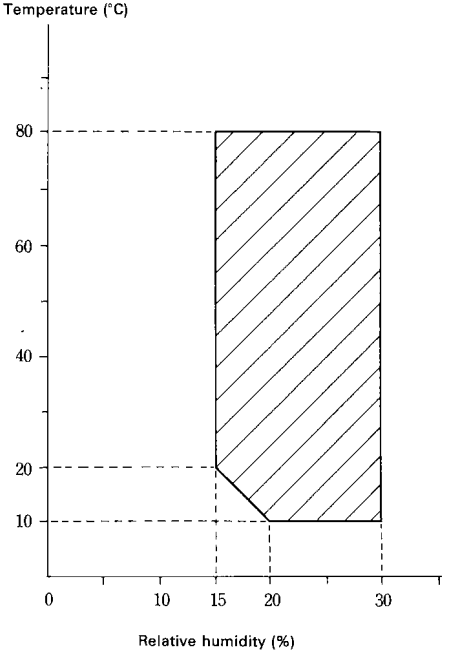

Figure 5-1 Permissible environmental conditions

(3) The printer should not be exposed to open flames, dust, ammonia fumes, or direct sunlight. A heavy curtain can be put up to protect it if it must be installed under direct sunlight.
(4) The room should be well ventilated.
(5) The printer should be installed level on a sturdy support, such as a pedestal or desk, with all feet in firm contact.
(6) The copying machine should be located at least 10 cm (4") from the wall behind it, and there should be sufficient space to permit unimpeded operation.

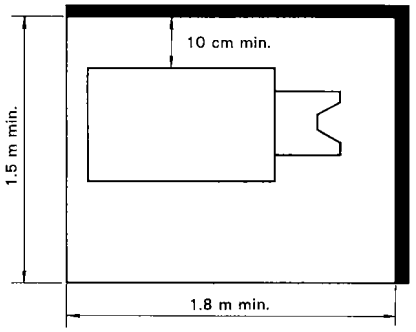

Figure 5-2

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II. UNPACKING AND INSTALLATION

When a piece of metal is moved from a cold place to a warm place, droplets of water form on its surface. This phenomenon is known as condensation. Condensation affects the performance of machines. The simplest way to eliminate condensation from the copying machine, any machines for that matter, is to leave it alone until it warms to room temperature (at least one hour).

Step	Work	Checks	Remarks
1	Unpack the shipping carton.		
2	Lift the machine off the skid.		The machine weighs about 222 kg and requires six people to lift it.
3	Open the cardboard box, and take out the parts and materials.	Check that the following are available: • Drum • Screw (3 pcs.) • Copy tray • Manual feed tray • Security key • Silicone oil bottle/valve • Cassettes	
4	Remove the inner front cover.		
5	Remove the sponge from the oil applying unit.		
6	Attach the valve on the silicone oil bottle, and mount the bottle on the bottle mount of the copying machine.	Check that the waste oil bottle is in place.	Check that the machine is level using a level gauge.
7	Open the delivery unit, and remove the two fixing screws from the upper cover.		
8	Install the scanner unit.		See the SCANNER SERVICE MANUAL for installation details (CHAPTER 4).
9	Connect the connection cable and power cord to the scanner and printer units.		See Figure 5-3.
10	Open the face plate of the laser scanner unit. Loosen the screw holding the lock plate of the laser scanner unit, and move the lock plate to the right.	Check that the shaft of the laser scanner motor moves up when the lock plate is moved to the right.	See Figure 5-4.
11	Fix the upper cover with two screws, and close the delivery unit.		
12	Remove the left cover and rear cover, and actuate the door switch with tape.		The "CLOSE THE DOOR" message will not go OFF without actuation of the door switch.

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Step	Work	Checks	Remarks
13	Remove the four developing assemblies.	Check that the developing cylinder is free of dirt or damage.	
14	Remove the cap of the developing assembly, and pour starter developer into the developing assembly.	Check the location of the toner supply mouth of the developing assembly to avoid scattering of toner.	See Figure 5-5.
15	Put the cap back on the developing assembly. Hold the developing assembly with the developing cylinder at the bottom, and turn it several times about 90 deg.		See Figure 5-6.
16	Turn the gear of the developing assembly to coat the developing sleeve with toner.		
17	Remove the toner supply stopper from the toner collection unit.		
18	Turn the turret so that the toner supply mouth of the color of the toner to be supplied to the hopper unit is at the bottom.	• The toner may leak from the toner supply mouth if it is poured without attaching the stopper in the toner supply mouth. • The stopper may suffer damage if the turret is turned without detaching the stopper.	See Figure 5-7. • The toner may scatter if the stopper is detached immediately after the toner is poured; wait for about 3 minutes before detachment.
33	Attach the toner supply stopper in the toner supply mouth of the turret. (The stopper is on the left of the toner collection bottle.)		
20	Pour toner of the color shown on the toner supply mouth.		
21	Repeat steps 18) through 20) to pour all different toners.		
22	Remove the stopper from the turret.		Keep the stopper by the side of the toner collection bottle.
23	Remove the two screws, four connectors, and grounding wire, and remove the transfer drum.	Check that the transfer drum sheet is free of dents or peels.	
24	Remove the primary corona unit.		
25	Remove the pre-cleaning corona unit, and mount the toner catch unit.		
26	Remove the cleaning unit and remove the toner catch unit.		
27	Remove the screw, and release the side cleaner unit to the right.		See Figure 5-8.
28	Remove the centering plate.		

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Step	Work	Checks	Remarks
29	Pull the lever, and release the potential sensor.		
30	Remove the drum fixing ring.		
31	Connect the extension pipe to the drum shaft.		
32	Check that the turret is at the home position. Keep the light-blocking sheet on the photosensitive drum, and mount the drum in the copying machine.		
33	Remove the extension pipe.		
34	Mount the drum fixing ring.	Keep the protrusion of the ring toward the photosensitive drum.	
35	Mount the drum centering plate.	Check that the lever of the potential sensor unit is set.	
36	Remove the light blocking sheet from the photosensitive drum.		
37	Mount the side cleaner unit and toner catch unit.		
38	Apply a sufficient amount of lubricant on the cleaning blade.	Use lubricant (TKN-0480).	See Figure 5-9.
39	Attach the drum cleaning assembly to the copier, and detach the toner receptacle; however, keep the drum cleaning assembly of the CLC500 released. In the case of the CLC550, fix the drum cleaning assembly.		
40	Mount the primary corona unit.		
41	Mount the transfer drum.		
42	Connect the power plug to the power outlet, and turn the printer and scanner units ON.		
43	Set copy paper in the cassette, and set the cassette in the copying machine.		
44	Assemble the copy tray and manual feed tray using three screws, and set them on the copying machine.		
45	Insert the security key.		
46	Press the following keys (service mode) after warm-up to enter initial data on the environment. ☒4☒ ☒1 0 6☒1☒		

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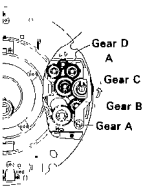
Step	Work	Checks	Remarks
47	Place a large sheet of paper under the toner supply mouth of the turret.		
48	Select one of the following addresses in the service mode ([X][4][X]): M toner [X][1][2][4][X] C toner [X][1][2][5][X] Y toner [X][1][2][6][X] BK toner [X][1][2][7][X]		
49	Repeat pressing the [1] and [X] keys until toner falls through the toner supply mouth of the turret.		
50	Repeat steps 46) through 49) for all different toners.		
51	Install the developing assembly on the turret with the lock arm released; turn gears D and C into the direction of the arrow to engage gears B and A.	Fix the lock arm.	
52	Set all developing assemblies as in step 51.	• Check that the gears of the developing assemblies and turret are engaged.	
53	Enter the following in the service mode to apply toner on the photosensitive drum. [X][4][X][X][1][5][2][X][1][X]	Do not repeat the key operation.	
54	Mount the cleaning unit.		
55	Turn the knob of the transfer drum to free the photosensitive drum of toner.		
56	Mount the pre-cleaning corona unit.		
57	Enter the following in he service mode to stir the toner inside the developing assembly. [X][4][X][X][1][3][0][X][1][X]	• The machine operates for about 3.5 minutes and stops automatically.	
58	• Enter [X][1][3][1][X][1][X] to set the concentration of magenta, and adjust it to 4.00 ±0.2 V using VR403; thereafter, press the [0] and [X] keys.	Check that "P131" is indicated.	• VR401, VR403, VR405, and VR407 are found on the display PCB. • The value adjusted by the VR is indicated as "P4.00" on the 7-segment LEDs (4 LEDs).
59	• Enter [X][1][3][2][X][1][X] to set the concentration of cyan, and adjust it to 4.00±0.2 V using VR405; thereafter, press the [0] and [X] keys.	Check that "P132" is indicated.	

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Step	Work	Checks	Remarks
60	• Enter [1][3][3][1] to set the concentration of yellow, and adjust it to 4.00 ±0.2 V using VR401; thereafter, press the [0] and [ ] keys.	Check that "P133" is indicated.	
61	• Enter [1][3][4][1] to set the concentration of black, and adjust it to 4.00 ±0.2 V using VR407; thereafter, press the [0] and [ ] keys.	Check that the "P134" is indicated.	
62	Enter [1][3][5][1] in the service mode to register the concentration of the four colors.	Check that "P135" is indicated. • The machine operates for about 3.5 minutes and stops automatically.	
63	Press the [C] key twice.		
64	Enter the following, and check that the following is true: CLC 500 ..... 4.00 ±0.2 V CLC 550 ..... 4.00 ±0.4 V [1] [2][5][0] for M [2][5][1] for C [2][5][2] for Y [2][5][3] for BK Otherwise, adjust the VRs once again and repeat step 58) and onward.		
65	Record the values indicated for L240 through L247 on the label (service mode).		The label is attached to the hopper front cover.
66	Press the [C] key twice.		
67	Enter the following in the service mode for potential control. [4] [1][0][1] [ ]		
68	Set the Test Sheet on the copyboard, and check the copy operation.	• Check that the specified number of copies is made. • Check that there is no abnormal sound. • Check the copy quality.	If the copy quality has a problem, make the adjustments shown in the Basic Image Adjustment Procedure.
69	If the copy density is too light or too dark, make the following adjustments: [4] if too light, [1][0][5] [1] if too dark, [1][0][4] [1] A press on the [1] and then [ ] keys changes the density by a signal step (5 steps max.).	Check the image density; if not normal, try switching the target contrast potential setting to the manual mode (enter [3] [1][0][1] so that the indication is "1").	

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Step	Work	Checks	Remarks
70	Set the options mode according to the needs of the user; thereafter, press the [C] key twice.		
71	Mount all covers.		
72	Move the machine to its final location.		
73	Adjust the feet using the level (CK-0059) so that the machine is level; it is particularly important to keep the oil application unit level.	See Figure 5-10 for points of measurement using the level.	If the floor is not solid or the machine cannot be kept level, place a plate (of steel or other) larger larger than the machine area, and fix the machine in place.
74	Record necessary information in the Service Sheet.		

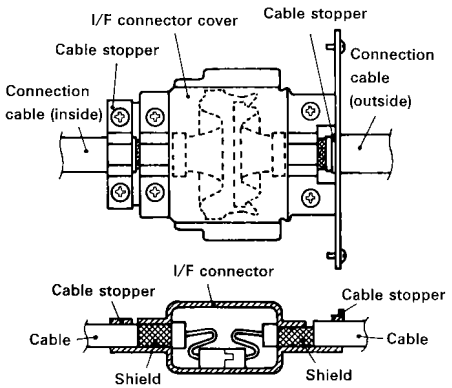
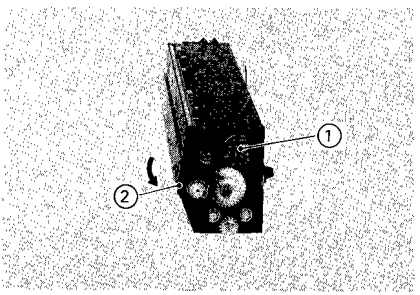
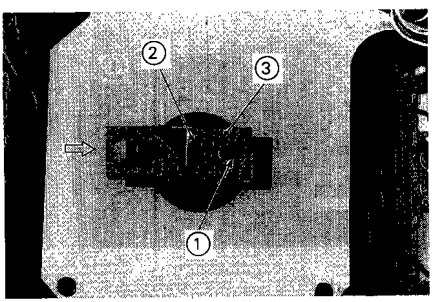


Figure 5-3



① Cap ② Gear

Figure 5-5



① Screws ③ Lock plate
② Mounting screw

Figure 5-4

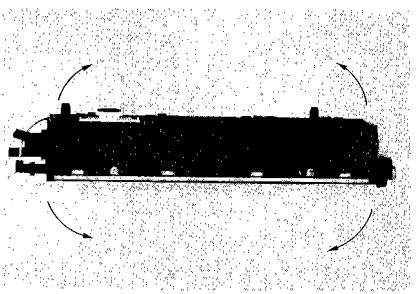


Figure 5-6

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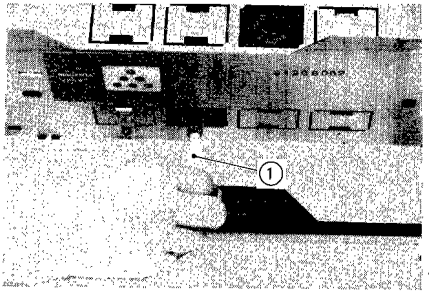
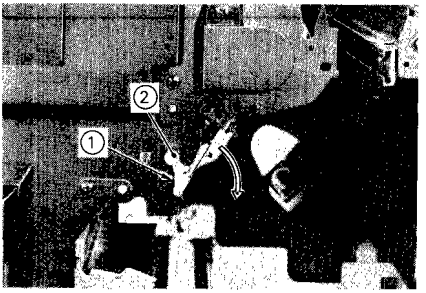


① Turret toner supply stopper

Figure 5-7

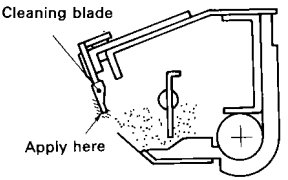


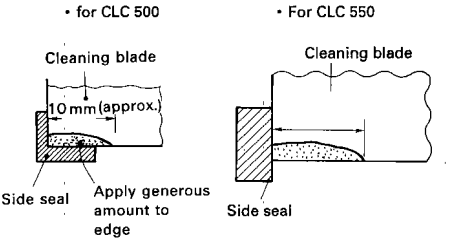
① Screw ② Lever

Figure 5-8

Applying the Lubricant

a. Section where the blade and drum come into contact.
b. Both edges of the blade; in particular, contact edge should be fully covered.
c. Both ends of the blade; the ends should be fully covered.
Use the tips of fingers when applying the lubricant; take care not to scratch the edges by fingernails.





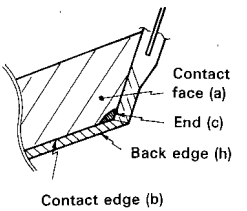
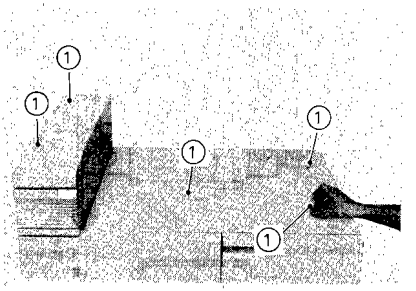
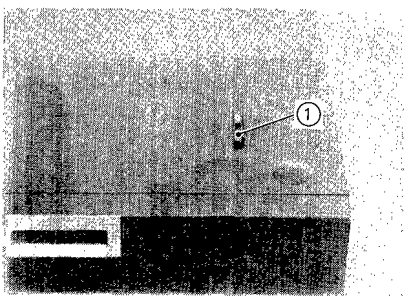


Figure 5-9



① Points of measurement

Figure 5-10a



① Level

Figure 5-10b

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III. RELOCATION

If the machine needs to be moved by truck or other means of transportation, perform the following:

Step	Work	Checks	Remarks
1	Remove the left cover.		
2	Remove all developing assemblies.	Be sure to pack the developing assemblies separately from others for transport.	
3	Actuate the left cover switch with tape.		
4	Attach a plastic bag over the toner supply mouth of the turret to empty the hopper unit.		
5	Enter the service mode (✳ 4 ✳), and empty the hopper of toner: M toner ..... P234 C toner ..... P235 Y toner ..... P236 BK toner P237		
6	Tape the toner supply mouth of the turret.		
7	Wrap the scanner.		For details, see the SCANNER SERVICE MANUAL (CHAPTER 4).
8	Move the upper cover of the printer to the right.		
9	Loosen the screw on the scanner unit, lower the shaft of the scanner motor, move the lock plate to the left, and lock the scanner.	• Check that the shaft is lowered.	See Figure 5-4; opposite of the arrow.
10	Remove the photosensitive drum.	Be sure to pack the photosensitive drum separately from others for transport.	
11	Remove the silicone oil bottle.	Be sure to pack the silicone oil bottle separately from others for transport.	
12	Empty the oil application unit of oil.		
13	Remove the waste oil bottle.		

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Step	Work	Checks	Remarks
14	Fix the transfer drum unit in place using two screws.		
15	Fix the release lever and knob of the transfer drum in place using a string.		
16	Fix the release lever of the registration unit in place using a string.		
17	Mount the left cover and upper cover.		
18	Tape the front door, delivery unit, and hopper cover in place.		

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I. PERIODICALLY REPLACED PARTS

The following is a list of parts that need to be replaced on a periodical basis; they may be free of damage but should be replaced as scheduled to maintain the performance of the machine. Replace the parts during the periodical servicing closest to the lives of the parts.

as of end of JAN., 1993

No.	Parts name	Parts No.	Qt'y	Life (copies)	Remarks
1	Corona wires (primary, transfer, static eliminator, separation, precleaning, prefixing units)	FY3-0030-000	AR	20,000	100 V
		FY3-0040-000	AR	20,000	115/220/240 V
2	Primary corona wire cleaner	FF2-1989-020	1	20,000	
3	Ozone filter	FA5-3004-000	2	20,000	or 1yr 100/115 V
		FA6-3990-000	2	10,000	or 1yr 220/240 V
4	Dust filter (toner collection motor unit)	FA6-0122-000	1	20,000	
5	Dust filter (toner collection motor unit)	FA6-0123-000	1	20,000	
6	Primary filter (fan unit of primary corona unit)	FA4-9073-040	2	20,000	
7	Developing filter	FA4-9208-000	1	20,000	
8	Suction filter (suction fan unit)	FA4-9073-040	1	20,000	
9	Grid wire (primary corona unit)	Y81-0162-000	AR	50,000	
10	Developing bias brush	FA4-8402-020	1	100,000	
11	Power supply brush (drum heater unit)	FA3-0859-040	1	100,000	
12	Power supply ring (drum heater unit)	FA3-0858-000	1	100,000	
13	Grounding brush (drum centering plate unit)	FA4-8356-000	1	100,000	
14	Grounding leaf spring (transfer drum unit)	FA4-8900-000	1	100,000	

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II. CONSUMABLES

The following is a list of consumables that may have to be replaced once or more over the warranty period of the product; replace them when they prove to be faulty.

as of end of Jan., 1993

No.	Parts name	Parts No.	Qt'y	Life (copies)	Remarks
1	Silicone oil (S20)	KF8-0005-000	1	8,000	
2	Waste toner case	FG1-6563-000	1	10,000	
3	Cleaner blade (drum cleaning unit)	FF2-3463-000	1	10,000	CLC 500
		FF5-1827-000	1	20,000	CLC 550
4	Drum end blade (side cleaning unit)	FA6-3939-000	2	20,000	
5	Transfer sheet (transfer drum unit)	FG9-3098-000	1	20,000	Replace together.
6	Transfer sheet, Push-up sheet (transfer drum unit)	FF2-1957-000	1	20,000	
7	Scraper, Belt (transfer drum unit)	FF2-1961-000	2	20,000	
8	Scraper sheet (drum cleaning unit)	FF2-1984-000	1	20,000	
9	Side seal, front and rear (drum cleaning unit)	FF2-1985-000	1	20,000	CLC 500
		FF2-3405-000	1		
		FF5-1828-000	2	20,000	CLC 550
10	End felt, front (drum cleaning unit)	FA6-0964-020	1	20,000	
11	End felt, rear (drum cleaning unit)	FA6-3968-000	1	20,000	
12	Fixing upper roller (fixing assembly)	FA5-8751-000	1	20,000 or 1 yr.	CLC 500
		FB1-9435-000	1	50,000 or 2 yrs.	CLC 550
13	Starter developer (Y)	F41-6932-000	1	30,000	
14	Starter developer (M)	F41-6922-000	1	30,000	
15	Starter developer (C)	F41-6912-000	1	30,000	
16	Starter developer (BK)	F41-6902-000	1	30,000	
17	Lens lamp	FF2-1929-000	1	50,000	
18	Scraper (side cleaner unit)	FF2-3459-000	1	50,000	
19	Fixing lower roller (fixing assembly)	FA5-8752-000	1	50,000 or 1 yr.	
		FB1-9436-000	1	50,000 or 2 yrs.	
20	Oil applying roller (oil applying unit)	FA4-9186-030	1	50,000	
21	Roller (oil applying unit)	FB1-9446-000	1	100,000	CLC 550
22	Feed roller (pick-up unit)	FF5-1829-000	1	100,000	CLC 550
23	Pick-up roller (pick-up unit)	FF9-0581-030	4	100,000	CLC 500
		FF5-1822-000	4	100,000	CLC 550
24	Separation roller (pick-up unit)	FA4-8991-000	2	100,000	CLC 500
		FF5-1830-000	2	100,000	CLC 550

The values above are estimates only and are subject to change based on the future data.

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No.	Parts name	Parts No.	Qt'y	Life (copies)	Remarks
25	Brush (transfer drum cleaning unit)	FA4-8874-000	1	100,000	
26	Blade (oil applying unit)	FA9-1647-000	1	100,000	CLC 500
		FA5-8753-000	1	100,000	CLC 550
27	Halogen heater (fixing assembly)	FH7-4270-000	2	100,000	100 V
		FH7-4271-000	2	100,000	115 V
		FH7-4272-000	2	100,000	220 V
		FH7-4273-000	2	100,000	240 V
28	Cleaning belt, upper (fixing assembly)	FA6-1660-000	1	100,000	
29	Cleaning belt, lower (fixing assembly)	FA5-7195-000	1	100,000	
30	Pre-exposure lamp	FH7-3187-000	1	100,000	
31	ATR lamp filter	FF2-3173-030	1	200,000	
32	ATR FIBER CLEANING BRUSH	FA9-2101-020	1	200,000	
33	Separation claw, lower (delivery unit)	FA6-1672-000	4	200,000	CLC 500
		FB1-9448-000	4	200,000	CLC 550
34	Lower roller blade (fixing assembly)	FA2-8296-000	1	200,000	
35	Developing assembly (Y)	FG9-2657-130	1	300,000	
36	Developing assembly (M)	FG9-2658-130	1	300,000	
37	Developing assembly (C)	FG9-2659-130	1	300,000	
38	Developing assembly (BK)	FG9-2668-130	1	300,000	

The values above are estimates only and are subject to change based on the future data.

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III. PERIODICAL SERVICING

NOTE:

1. As a rule, perform the periodical servicing every 10,000 copies.
2. Check the Service Sheet before making a visit; take necessary parts if replacement is expected.

Step	Work	Checks	Remarks
1	Meet the operator.	Check the condition of the machine.	
2	Record the reading of the counter.	Check the problem copies.	
3	Make test copies in the DIRECT, REDUCE, and ENLARGE modes.	Check the following: a. Density of copies b. Dirt on back of copies c. Clarity of characters d. Margin at leading edge e. Margin on left/right sides f. Fixing/Registration failure g. Abnormal noise h. Counter operation	Standard: 8 ±1 mm (DIRECT) Standard: 2 ±1.5 mm (DIRECT) Standard: 2 ±1.5 mm (trailing edge)
4	Clean the corona units.		Dry wipe with lint-free paper; thereafter, clean with alcohol.
5	Clean the transfer drum and feed unit. • Separation claw • Toner receptacle		
6	Clean the fixing assembly and delivery unit. • Paper guide • Separation claw (upper, lower) Check the cleaning belt.		 Clean with solvent. Clean with solvent.
7	Perform periodical servicing (p. 6-5) according to the number of copies processed.		
8	Clean the copyboard cover and copyboard glass.		
9	Check the waste toner.		
10	Make test copies.		
11	Make sample copies.		
12	Put sample copies in order, and clean up the area around the machine.		
13	Record the reading of the counter.		
14	Enter necessary information in the Service Sheet, and report to the operator.		

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IV. PERIODICAL SERVICING CHART

Note:
Do not use solvents or oils other than specified.

△: Clean ●: Replace ×: Oil □: Adjust ◎: Check

Item	Parts	Maintenance interval					Remarks
		Every 10,000 copies	Every 20,000 copies	Every 50,000 copies	Every 100,000 copies	Every 300,000 copies	
External	Copyboard glass (scanner)	△					Clean with alcohol.
	Lower plate (scanner)	△					
	Ozone filter		●				or 1 yr.
	Spring clutch (transfer spacing, transfer brush)				×		Use oil.
	Filters (transfer, primary units; developing assembly; suction unit)		●				
	Developing bias brush				●		
	Power supply brush (drum heater)				●		
	Power supply ring (drum heater)				●		
	Grounding brush (drum centering plate)				●		
Feed unit	Feeder belt			△			
	Feeder unit mount			△			
Optical unit	Fiber optical lens array (scanner)	△					Use blower brush.
	Scanning lamp reflector (scanner)	△					Use lint-free paper.
	Dust glass	△					Use lint-free paper.
	Pre-exposure lamp filter	△					
Corona unit	Primary corona unit cleaner		●				
	Primary corona unit grid wire			●			Dry wipe with lint-free paper; thereafter, use alcohol.
	Corona wires (primary, static eliminator, separation, pre-cleaning, pre-fixing units)	△	●				
	Transfer corona unit	△					
	Static eliminator	△					
	Separation corona unit	△					
	Pre-fixing corona unit (CLC 500 only)	△					
	Pre-cleaning corona unit	△					

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Item	Parts	Maintenance interval					Remarks
		Every 10,000 copies	Every 20,000 copies	Every 50,000 copies	Every 100,000 copies	Every 300,000 copies	
Developing assembly	Positioning bearing		△				
	Side seal					●	
	Developing duct		△				Replace together with photosensitive drum.
Transfer drum unit	Transfer paper sensor (Q18)	△					
	Separation paper sensor (Q17)	△					
	Cleaning brush				●		
	Transfer scraper, Toner receptacle		△				
	Grounding brush				●		
Side cleaner unit	Roller scraper	△					
	Toner catch	△					
Fixing assembly	Paper guide	△					Use solvent.
	Separation claw	△					Use solvent.
	Thermistor		△				
	Lower roller blade		△				
Oil application unit	Blade		△				
Waste toner unit	Waste toner case	◎●					

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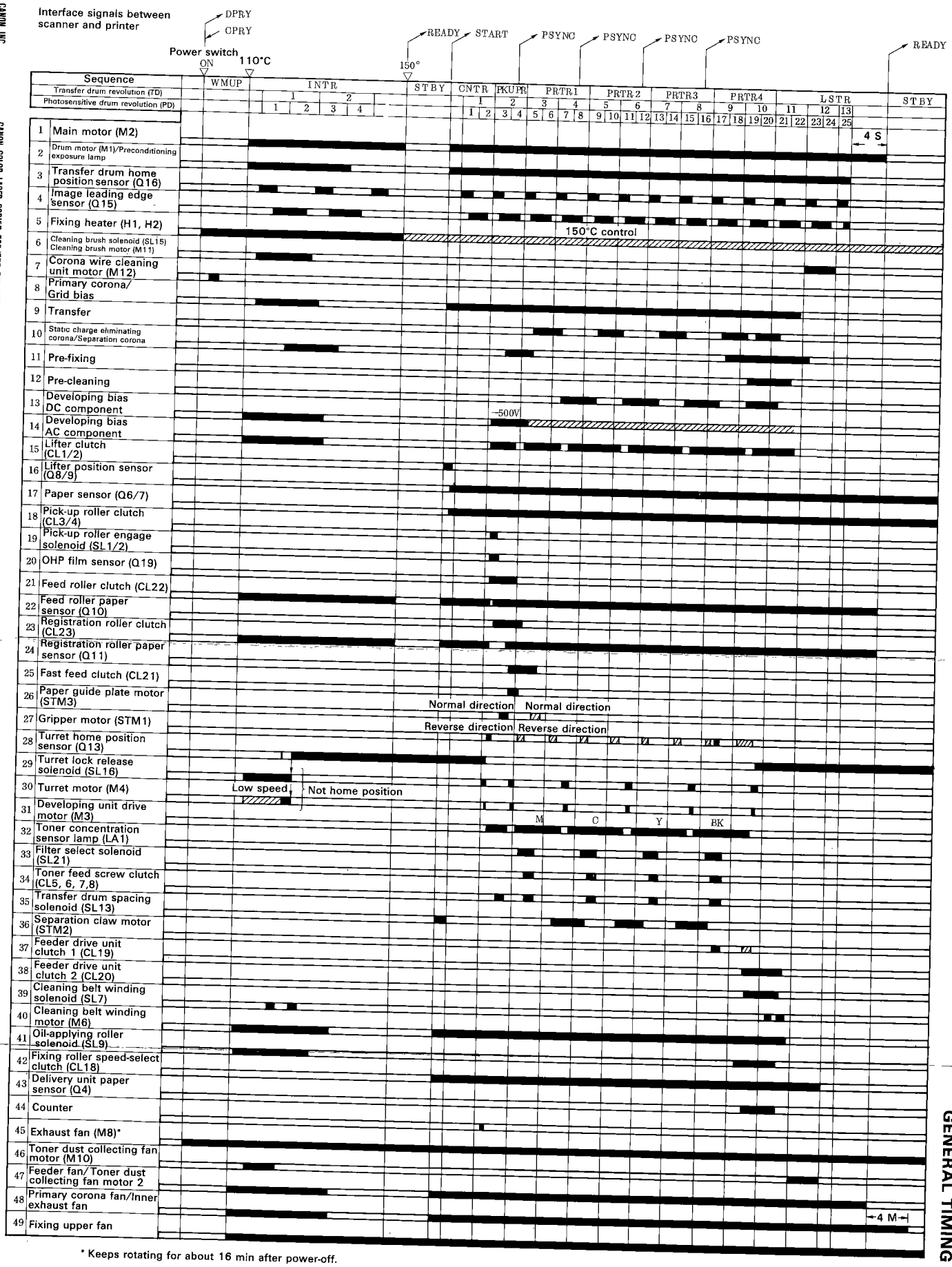
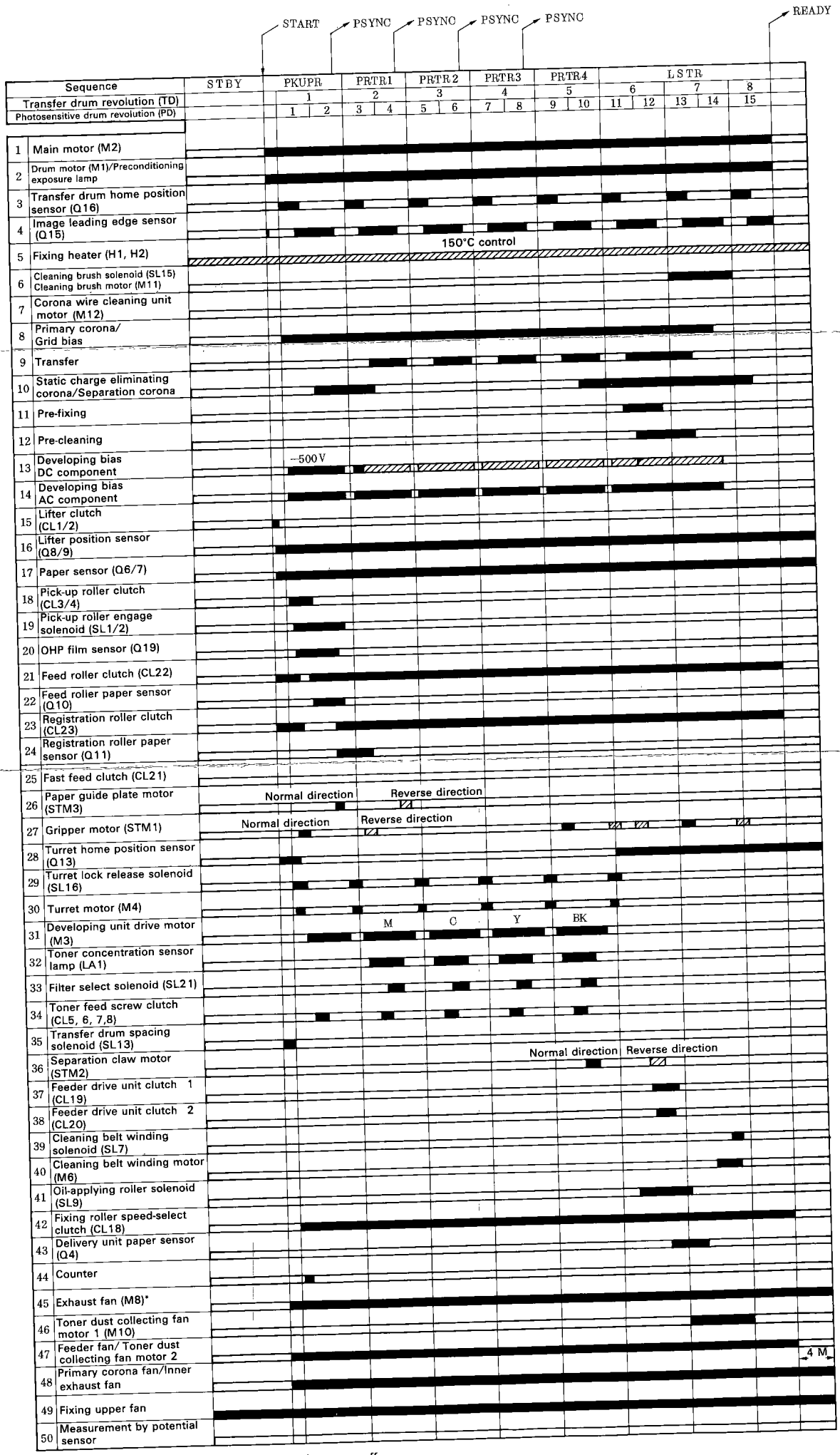
A. GENERAL TIMING CHART

GENERAL TIMING CHART (1/3)



* Keeps rotating for about 16 min after power-off.

A3/Ledger/Full color copie


START
PSYNC
PSYNC
PSYNC
PSYNC
READY
Sequence
STBY
PKUPR
PRTR1
PRTR2
PRTR3
PRTR4
LSTR
Transfer drum revolution (TD)
Photosensitive drum revolution (PD)
1 Main motor (M2)
2 Drum motor (M1)/Preconditioning exposure lamp
3 Transfer drum home position sensor (Q16)
4 Image leading edge sensor (Q15)
5 Fixing heater (H1, H2)
150°C control
6 Cleaning brush solenoid (SL15) Cleaning brush motor (M11)
7 Corona wire cleaning unit motor (M12)
8 Primary corona/ Grid bias
9 Transfer
10 Static charge eliminating corona/Separation corona
11 Pre-fixing
12 Pre-cleaning
13 Developing bias DC component
−500 V
14 Developing bias AC component
15 Lifter clutch (CL1/2)
16 Lifter position sensor (Q8/9)
17 Paper sensor (Q6/7)
18 Pick-up roller clutch (CL3/4)
19 Pick-up roller engage solenoid (SL1/2)
20 OHP film sensor (Q19)
21 Feed roller clutch (CL22)
22 Feed roller paper sensor (Q10)
23 Registration roller clutch (CL23)
24 Registration roller paper sensor (Q11)
25 Fast feed clutch (CL21)
26 Paper guide plate motor (STM3)
Normal direction
Reverse direction
27 Gripper motor (STM1)
Normal direction
Reverse direction
28 Turret home position sensor (Q13)
29 Turret lock release solenoid (SL16)
30 Turret motor (M4)
31 Developing unit drive motor (M3)
M
C
Y
BK
32 Toner concentration sensor lamp (LA1)
33 Filter select solenoid (SL21)
34 Toner feed screw clutch (CL5, 6, 7,8)
35 Transfer drum spacing solenoid (SL13)
36 Separation claw motor (STM2)
Normal direction
Reverse direction
37 Feeder drive unit clutch 1 (CL19)
38 Feeder drive unit clutch 2 (CL20)
39 Cleaning belt winding solenoid (SL7)
40 Cleaning belt winding motor (M6)
41 Oil-applying roller solenoid (SL9)
42 Fixing roller speed-select clutch (CL18)
43 Delivery unit paper sensor (Q4)
44 Counter
45 Exhaust fan (M8)*
46 Toner dust collecting fan motor 1 (M10)
47 Feeder fan/ Toner dust collecting fan motor 2
48 Primary corona fan/Inner exhaust fan
49 Fixing upper fan
50 Measurement by potential sensor
4 M

* Keeps rotating for about 16 min after power-off.

A4/Letter/Full color copie

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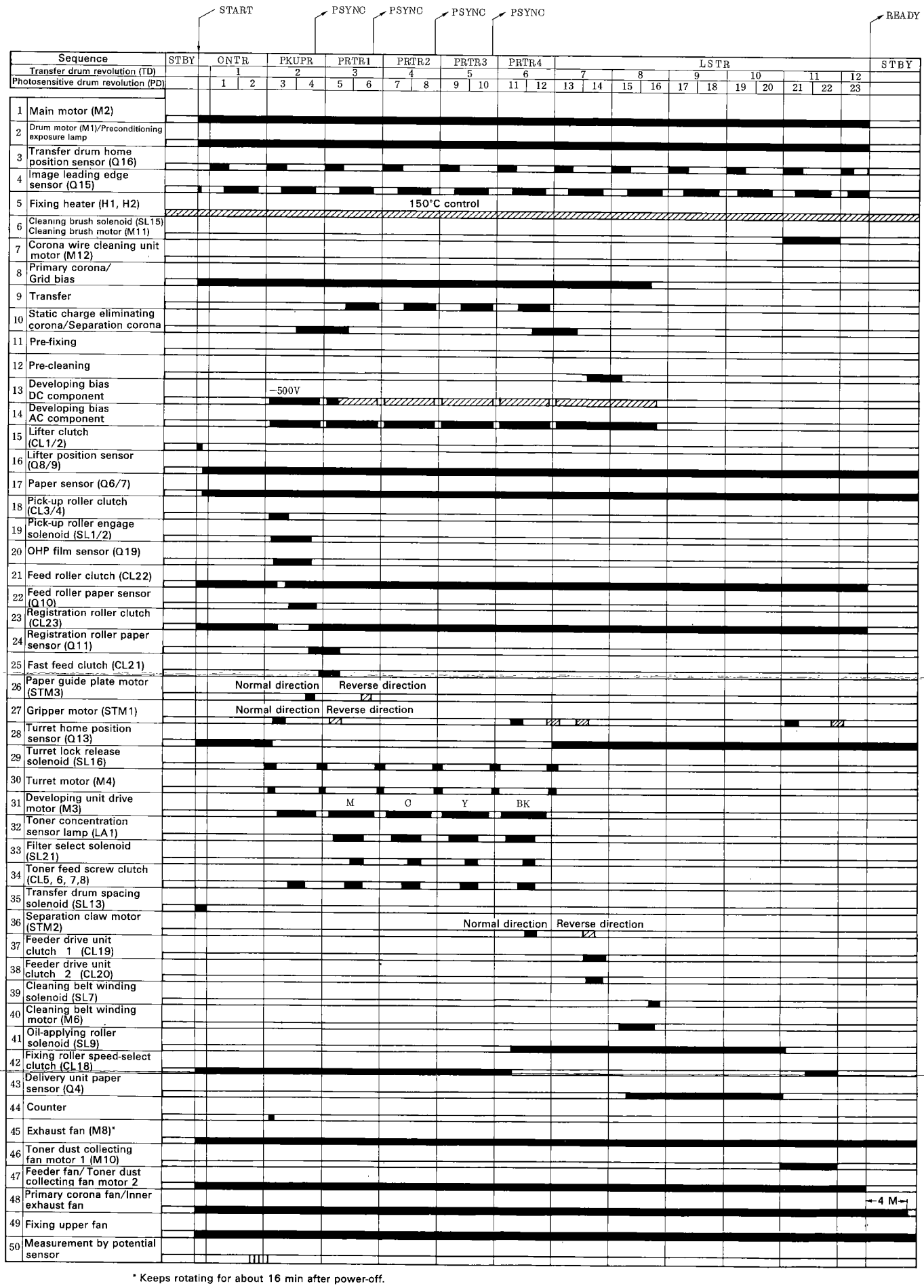

* Keeps rotating for about 16 min after power-off.

A4/OHP sheet

LIST OF SIGNALS/COMMANDS

SIGNALS/COMMANDS

ANGL	DEVELOPING MOTOR DRIVE INHIBIT
BD	BEAM DETECT signal
BKTEP	BLACK TONER OUT signal
BKTSSD	BLACK TONER SUPPLY CLUTCH DRIVE command
BMD	BRUSH MOTOR DRIVE command
BSD	BRUSH SOLENOID command
CBOUT	CLEANING BELT OUT signal
CLBMD	CLEANING BELT MOTOR DRIVE command
CLMD	WIRE CLEANER MOTOR DRIVE command
CLMF	WIRE CLEANER FORWARD signal
CNT2D	COUNTER 2 DRIVE command
CNT3D	COUNTER 3 DRIVE command
CNT4D	COUNTER 4 DRIVE command
CTEP	CYAN TONER OUT signal
CTSCD	CYAN TONER SUPPLY CLUTCH DRIVE command
DMD	DEVELOPING MOTOR DRIVE command
DMOL	DEVELOPING MOTOR OVER LOAD signal
DPLL	DRUM MOTOR PLL signal
DRO	DOOR OPEN signal
DRMD	DRUM MOTOR DRIVE command
EFMD	EXHAUST FAN MOTOR DRIVE command
FFMD	FEEDER SECTION FAN MOTOR DRIVE command
FRSD	FEED ROLLER CLUTCH DRIVE command
FSD	FILTER CHANGE SOLENOID DRIVE command
FCD1	FEEDER ASSEMBLY CLUTCH 1 DRIVE command
FCD2	FEEDER ASSEMBLY CLUTCH 2 DRIVE command
H.RESET	[TURRET CONTROLLER] RESET command
[HVBAC]	AC DEVELOPING BIAS DRIVE command
[HVBDC]	DC DEVELOPING BIAS CONTROL command
[HVGB]	PRIMARY GRID BIAS CONTROL command
HVPF	PRE-FIXING CORONA DRIVE command
HVPR	PRIMARY CORONA DRIVE command
HVSP	SEPARATION CORONA DRIVE command
HVTR	TRANSFER CORONA DRIVE command
[HVTRC]	TRANSFER CORONA CURRENT CONTROL command
IEFMD	INNER EXHAUST FAN MOTOR
ILEG	IMAGE LEADING EDGE signal
KEYL	KEY LOCK signal
LCSZ0	LOWER CASSETTE SIZE 0 signal
LCSZ1	LOWER CASSETTE SIZE 1 signal
LCSZ2	LOWER CASSETTE SIZE 2 signal
LCSZ3	LOWER CASSETTE SIZE 3 signal
LD	LESER DRIVE command
LHTRD	LOWER HEATER DRIVE
LLFTP	LOWER CASSETTE PAPER LIFTER POSITION SENSOR signal
LLTCD	LOWER CASSETTE PAPER LIFTER CLUTCH DRIVE command
LPEP	LOWER CASSETTE PAPER OUT signal
LPD	LENS POSITION DETECT signal
LPRSD	LOWER PICK-UP ROLLER ENGAGE SOLENOID DRIVE command
LPUCD	LOWER CASSETTE PICK-UP ROLLER CLUTCH DRIVE command
LSFCD	LOWER SPEED FIXING CLUTCH command
LSYNC	LINE SYNCRONOUS signal
MFS	MANUAL FEED SELECT signal
MMD	MAIN MOTOR DRIVE command
MOL	(REVOLVING DEVICE) MOTOR LOAD signal
MPLL	MAIN MOTOR PLL signal
MTEP	MAGENTA TONER OUT signal
MTSCD	MAGENTA TONER SUPPLY CLUTCH DRIVE command
OEP	OIL OUT signal
OHPDP	OHP SHEET DETECTION signal
OSSD	OIL SUPPLY SOLENOID DRIVE command
PCCD	PRECLEANING CORONA DRIVE command
PCDC	PRECLEANING CORONA CONTROL command
PCFD	PRIMARY CORONA FAN MOTOR DRIVE command
PDCD	(PAPER) DISCHARGING CORONA DRIVE command
PDDC	DC PAPER DISCHARGING CORONA DRIVE command
PDP1	PAPER DETECTION signal 1
PDP2	PAPER DETECTION signal 2
PDP3	PAPER DETECTION signal 3
PDP4	PAPER DETECTION signal 4
PDP5	PAPER DETECTION signal 5
PEND	(TURRET) PRE END signal
PEXP	PRECONDITIONING EXPOSURE LAMP DRIVE command
PGHP	PAPER GUIDE HOME POSITION signal
[POT]	SURFACE POTENTIAL signal
PRINT	PRINTER PRINT START command
PSYNC	PAGE SYNCRONOUS signal
READY	PRINTER READY signal
QFSD	QUICK FEEDING CLUTCH DRIVE command
RCVRC	REAR/LEFT CLUTCH signal
RGCD	REGISTRATION CLUTCH DRIVE command
RHP	TURRET HOME POSITION signal
RLR	TURRET LOCK LEVER RELEASE signal
RLRSD	TURRET LOCK LEVER RELEASE SOLENOID DRIVE command
RMD	TURRET MOTOR DRIVE command
RMRAC1	TURRET MOTOR ROTATION ANGEL CONTROL command 1
RMRAC2	TURRET MOTOR ROTATION ANGEL CONTROL command 2
RMRAC3	TURRET MOTOR ROTATION ANGLE CONTROL command 3
RMS	TURRET MOTOR STOP command
PUSP	PUSH UP SHEET SENSOR signal
SCNON	SCANNER MOTOR DRIVE command
SCNRDY	SCANNER READY signal
SRCHP	SEPARATION CLAW HOME POSITION signal
S.RESET	TURRET DRIVE [TOHP] command
TCNTD	TOTAL COUNTER DRIVE command
TDCM1	TONER/DUST COLLECT MOTOR 1 DRIVE command
TDCM2	TONER/DUST COLLECT MOTOR 2 DRIVE command
TDHP	TRANSFER DRUM HOME POSITION signal
TH1	THERMISTOR TH1 signal
TH2	THERMISTOR TH2 signal
TH3	THERMISTOR TH3 signal
TOSLD	TONER OUT SENSOR LAMP DRIVE command
TPRT	TEST PRINT command
TSSD	TRANSFER DRUM SEPARATE SOLENOID DRIVE command
UCSZ0	UPPER CASSETTE SIZE 0 signal
UCSZ1	UPPER CASSETTE SIZE 1 signal
UCSZ2	UPPER CASSETTE SIZE 2 signal
UCSZ3	UPPER CASSETTE SIZE 3 signal
UHTRD	UPPER HEATER DRIVE command
ULFTP	UPPER CASSETTE PAPER LIFTER POSITION SENSOR signal
ULTCD	UPPER CASSETTE PAPER LIFTER CLUTCH DRIVE command
UPEP	UPPER CASSETTE PAPER OUT signal
UPRSD	UPPER PICK-UP ROLLER ENGAGE SOLENOID DRIVE command
UPUCD	UPPER CASSETTE PICK-UP ROLLER CLUTCH DRIVE command
VCLK	VIDEO CLOCK PULSE signal
VDO7-0	VIDEO signal
WTOFP	EXCESS WASTE TONER signal
YTEP	YELLOW TONER OUT signal
YTSCD	YELLOW TONER SUPPLY CLUTCH DRIVE command

LIST OF ABBREVIATION

CNTR	ADJUSTMENT (CONTROL) ROTATION
INTR	INITIAL ROTATION
LSTR	LAST ROTATION
PKUPR	PICK-UP ROTATION
PRTR1	PRINT ROTATION1
PRTR2	PRINT ROTATION2
PRTR3	PRINT ROTATION3
PRTR4	PRINT ROTATION4
STBY	STAND BY
WMUP	WARM UP ROTATION

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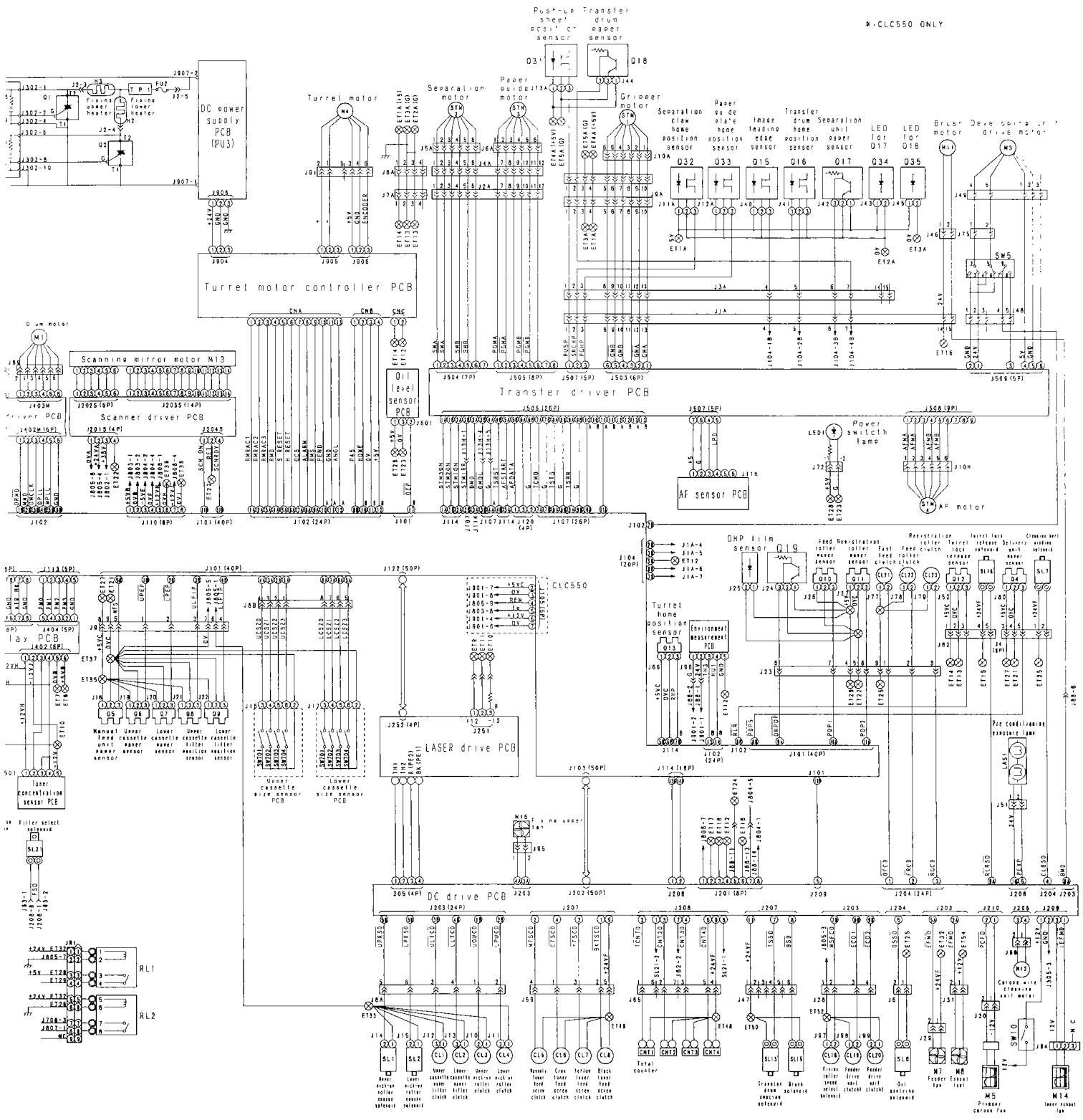
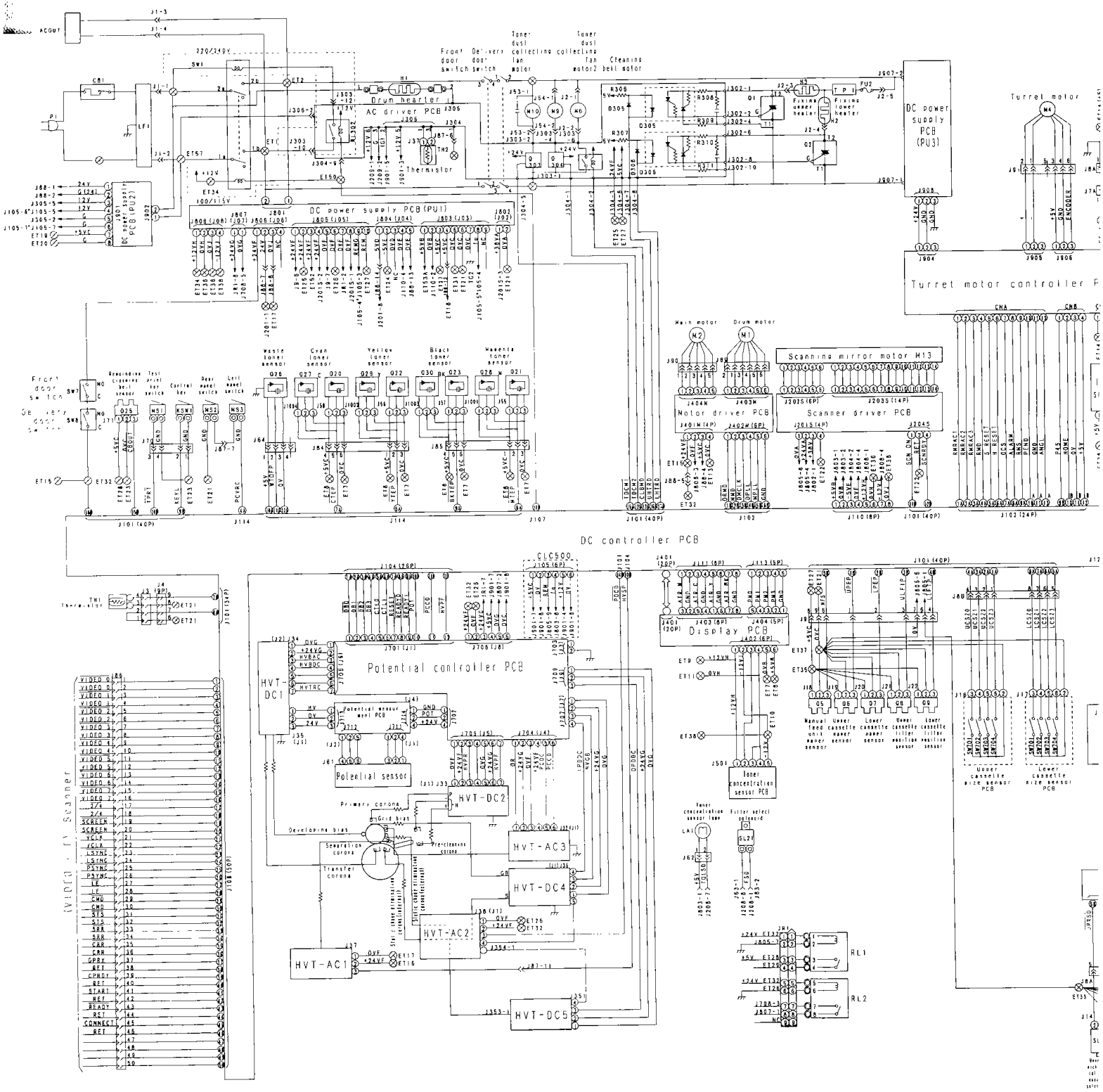
C. PRINTER GENERAL CIRCUIT DIAGRAM





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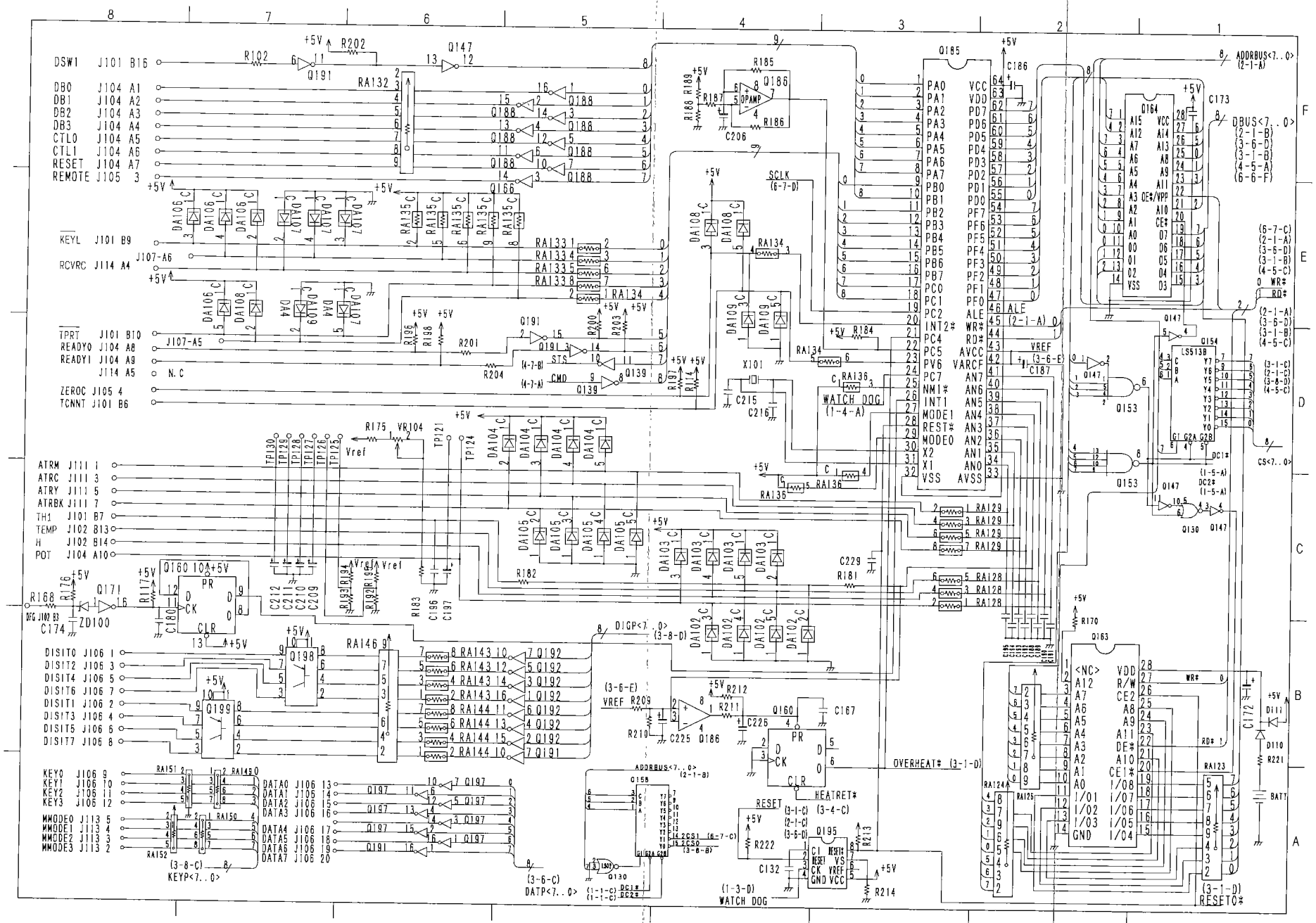
D-1. CLC500 DC CONTROLLER CIRCUIT DIAGRAM

CLC500 DC controller circuit diagram (1/6)



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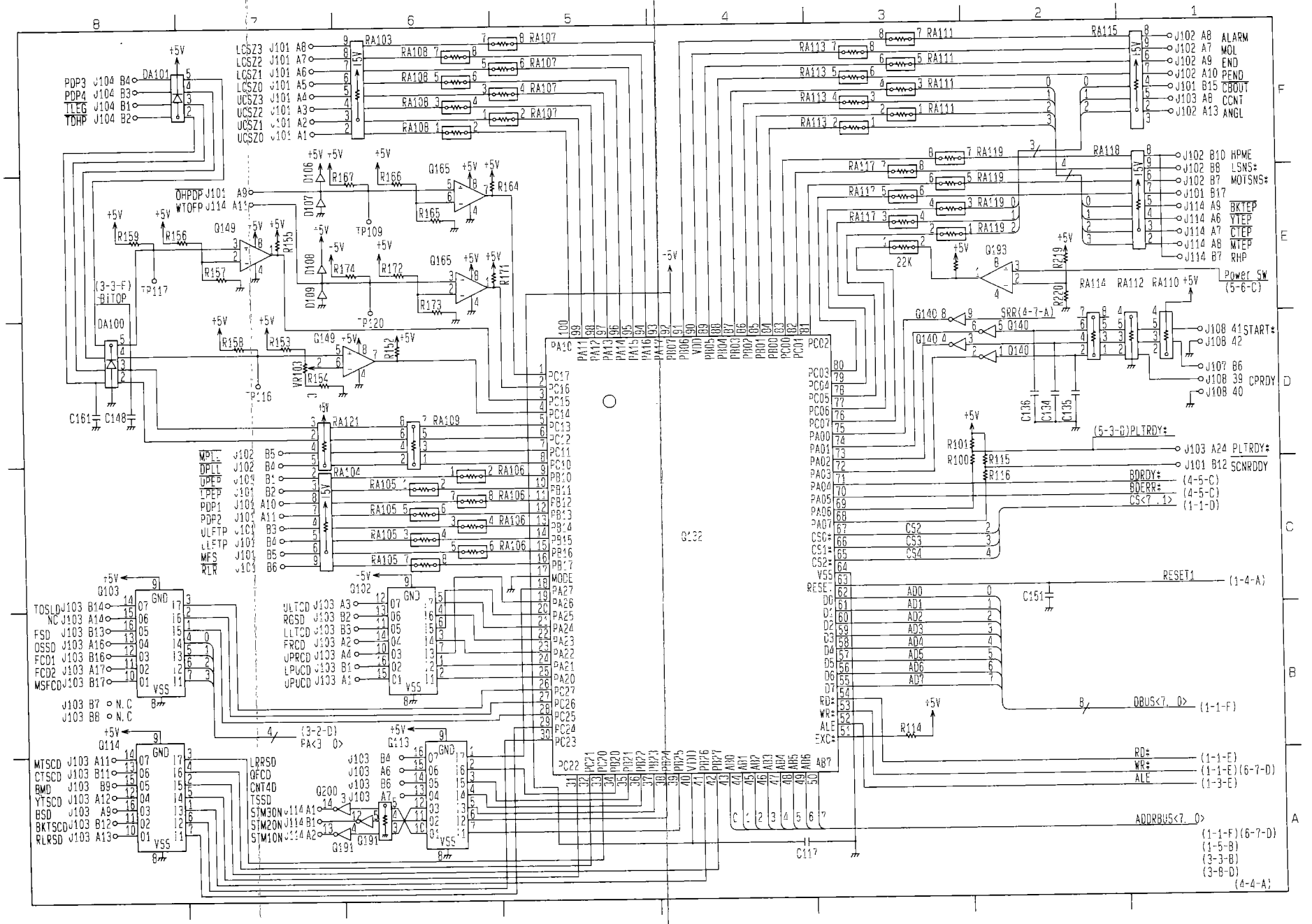
CLC500 DC controller circuit diagram (2/6)



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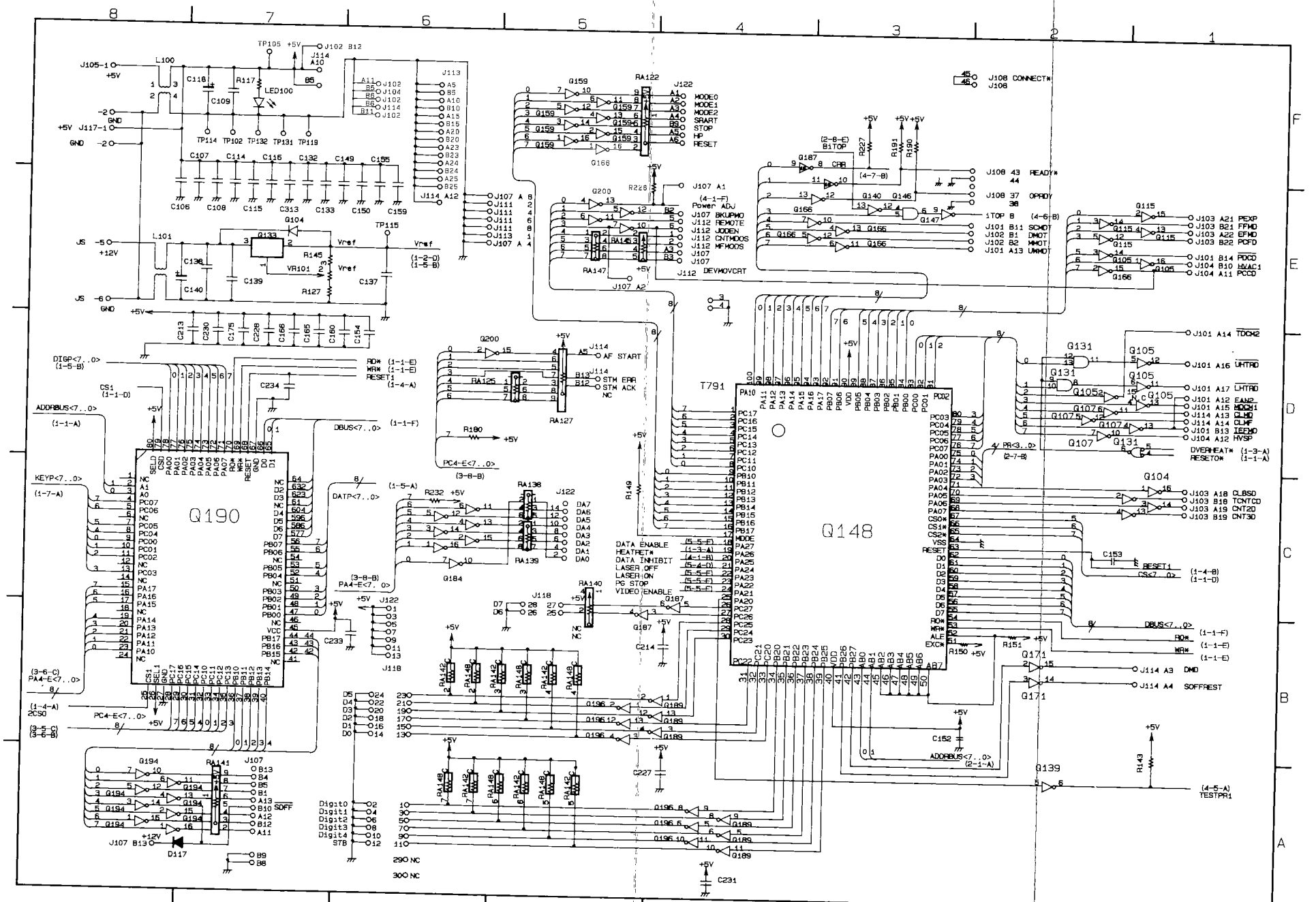

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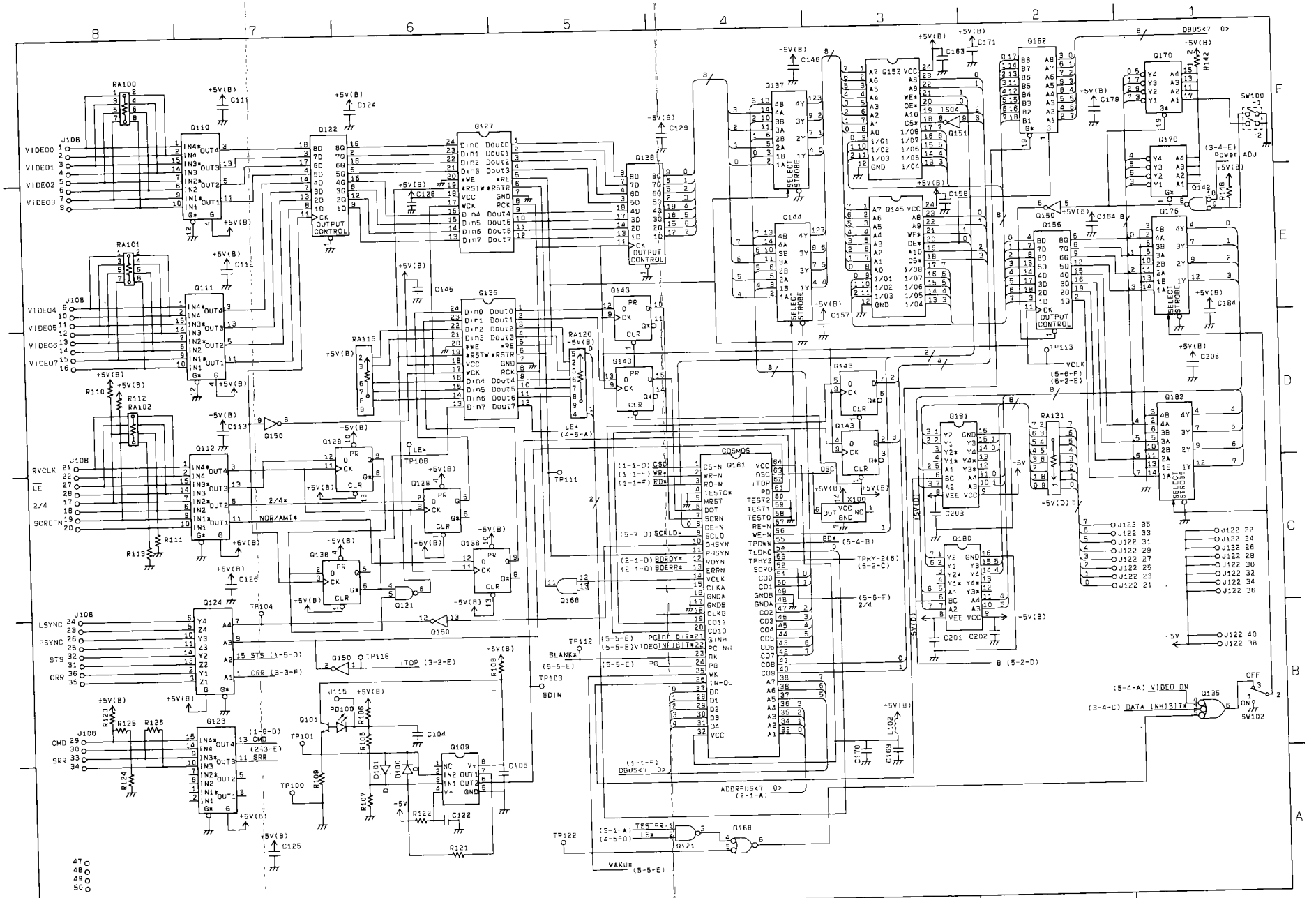
CLC500 DC controller circuit diagram (4/6)



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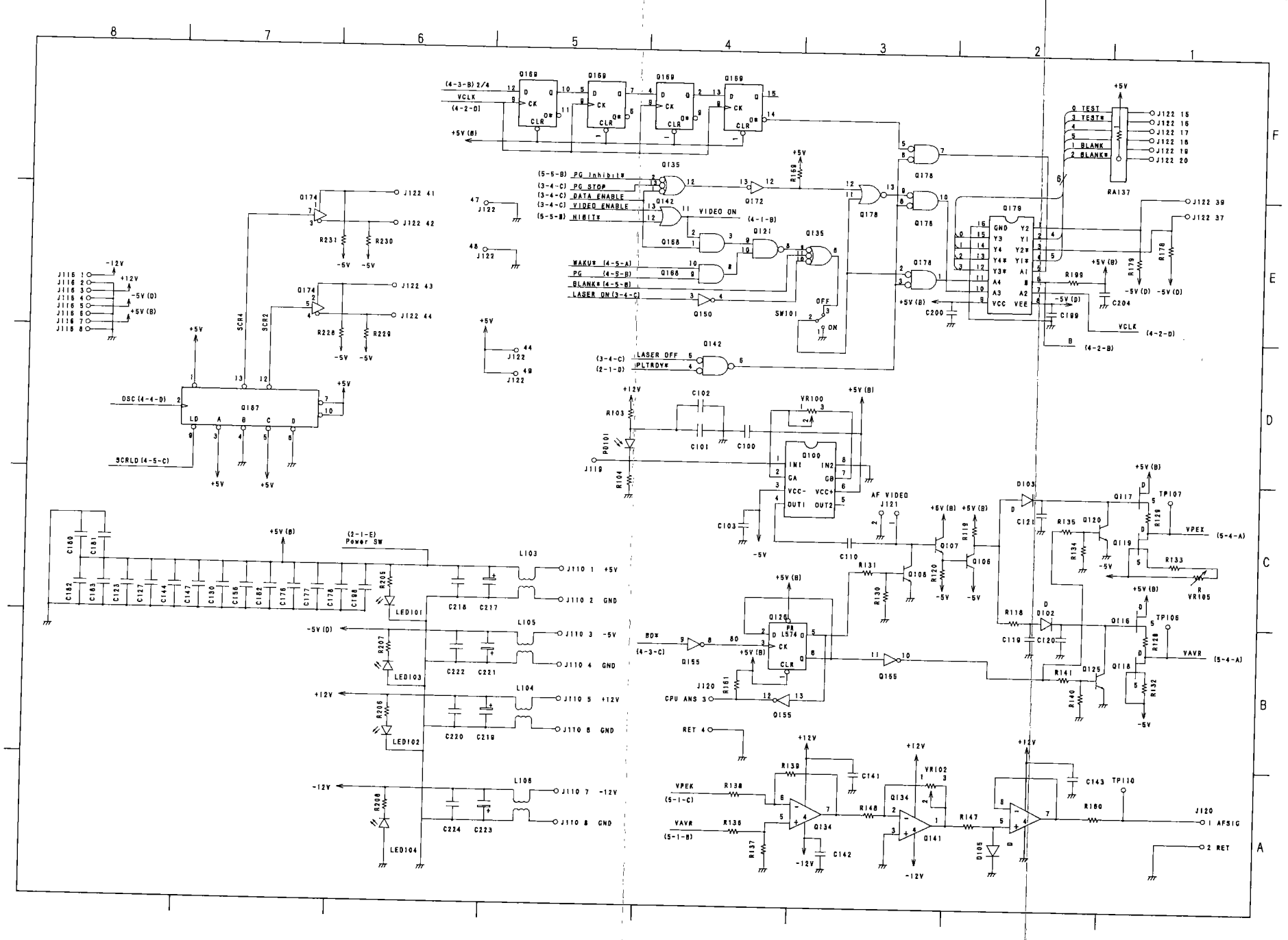

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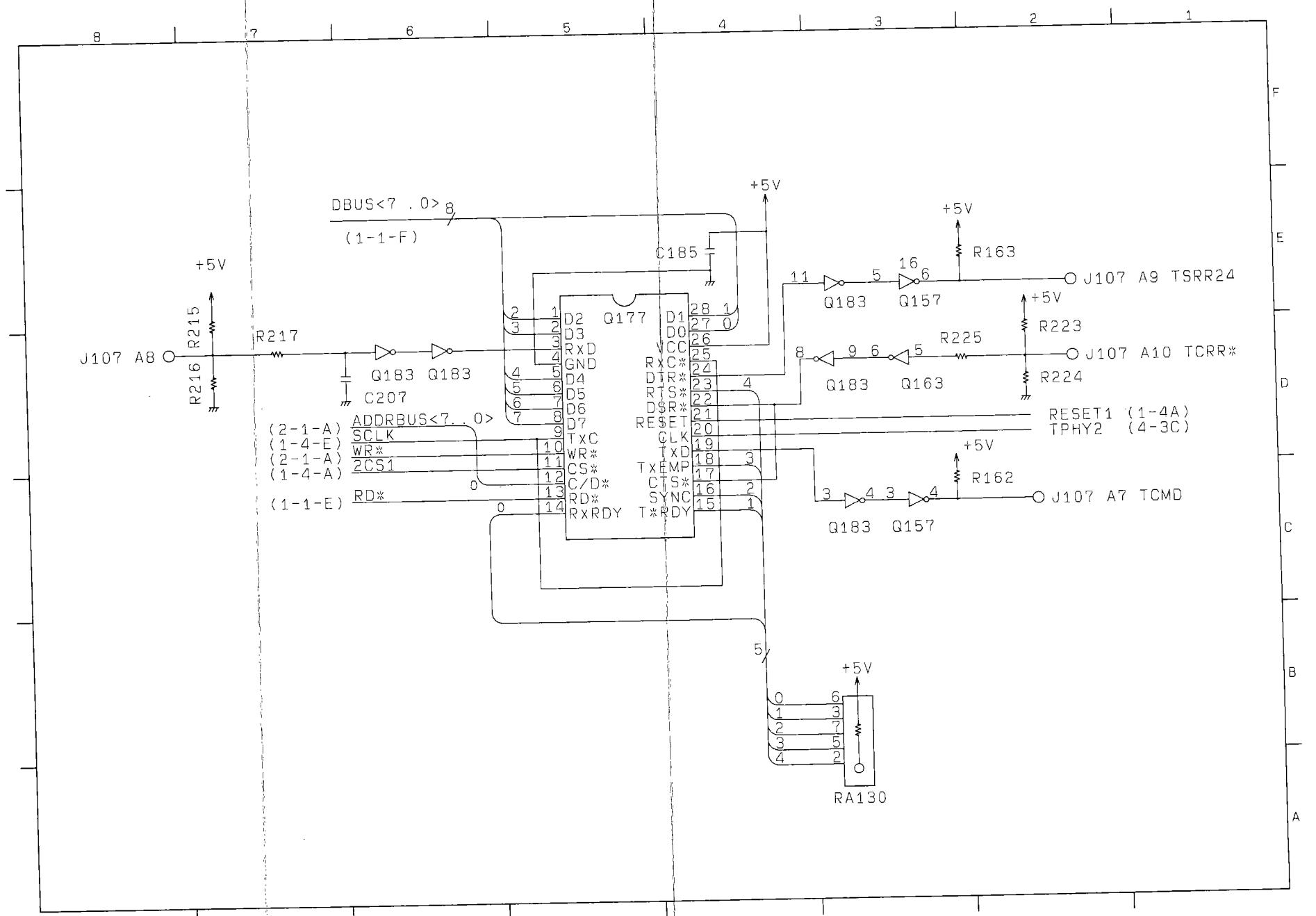
CLC500 DC controller circuit diagram (6/6)



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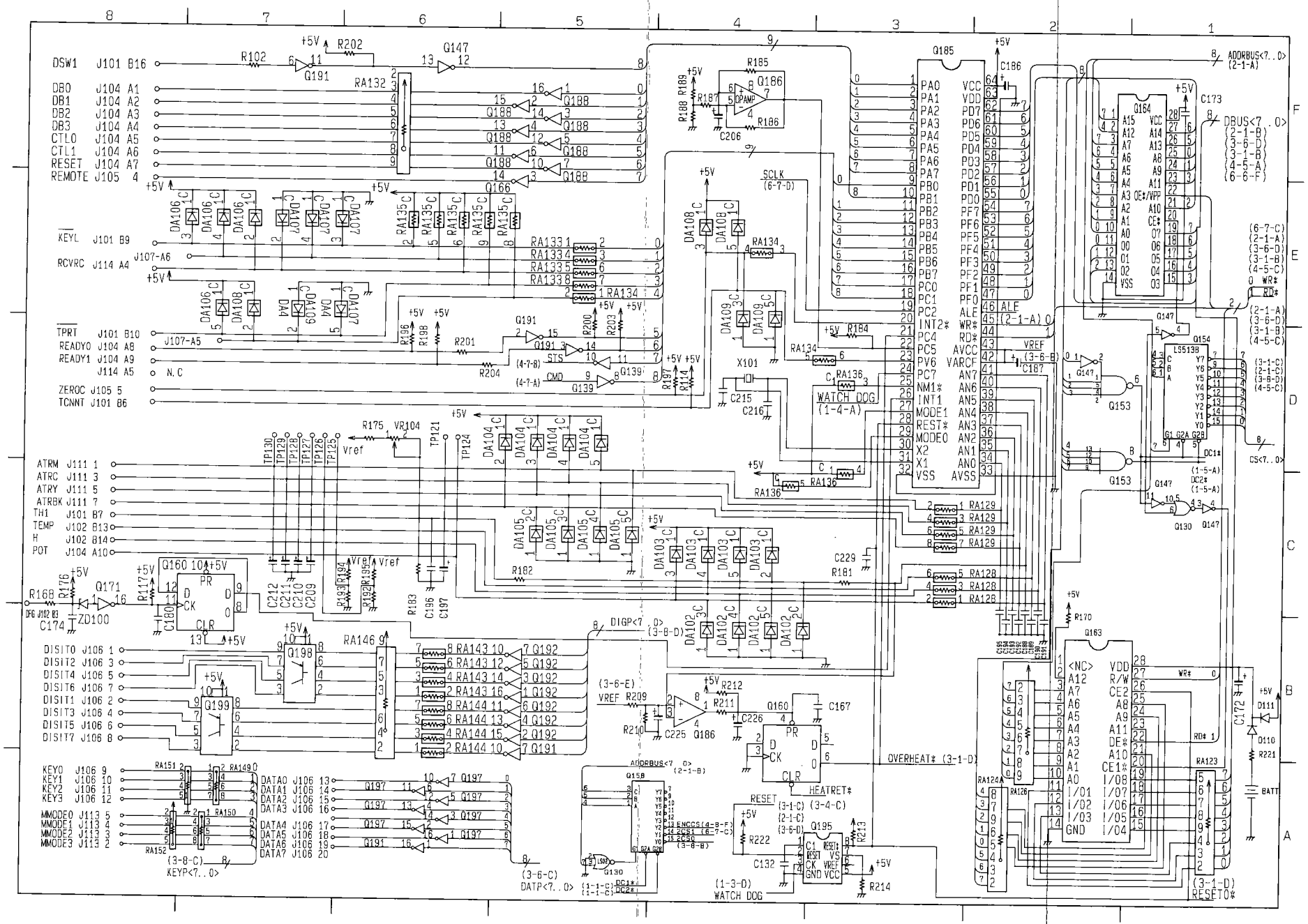
D-2. CLC550 DC CONTROLLER CIRCUIT DIAGRAM

CLC550 DC controller circuit diagram (1/6)



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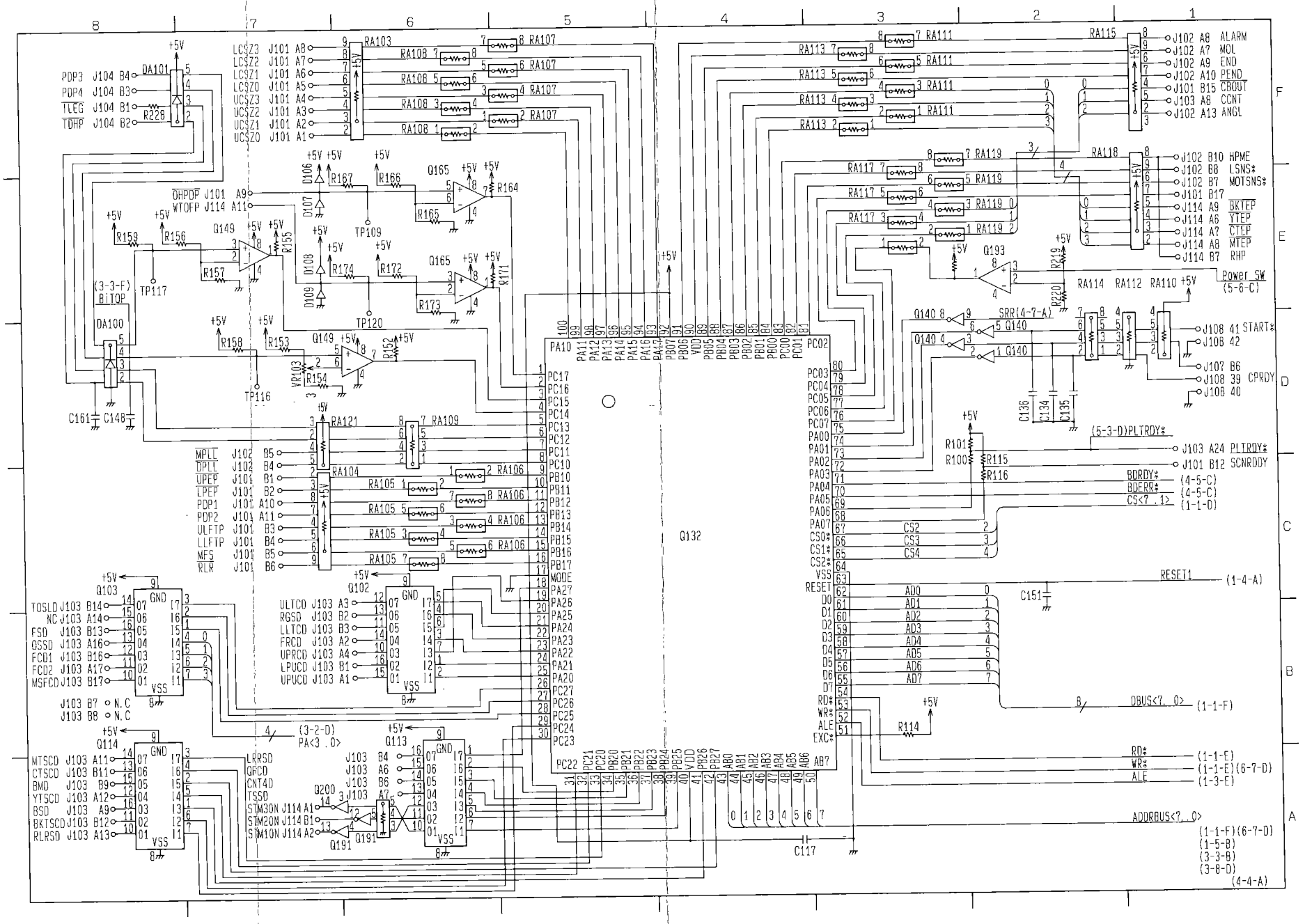
CLC550 DC controller circuit diagram (2/6)



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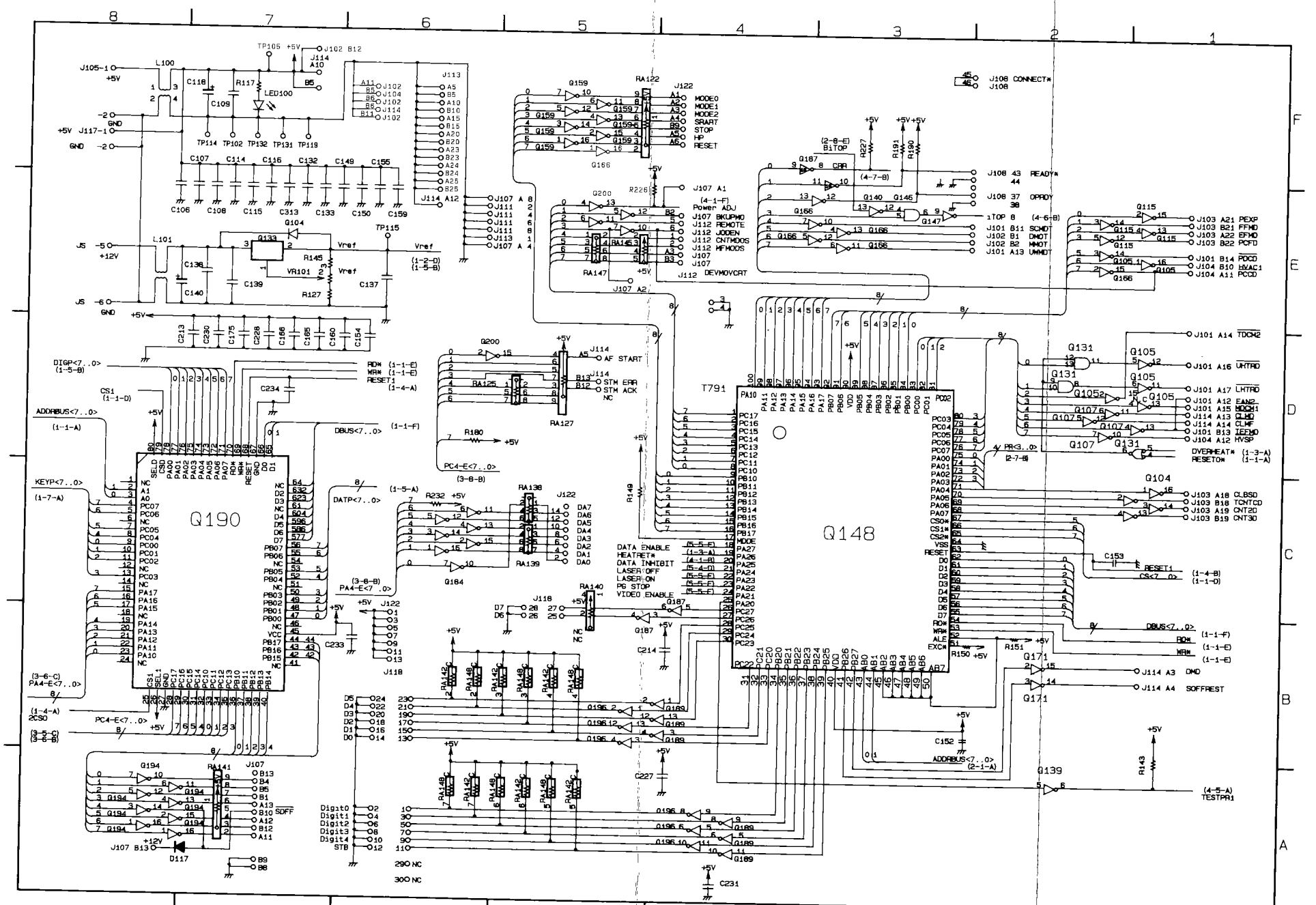

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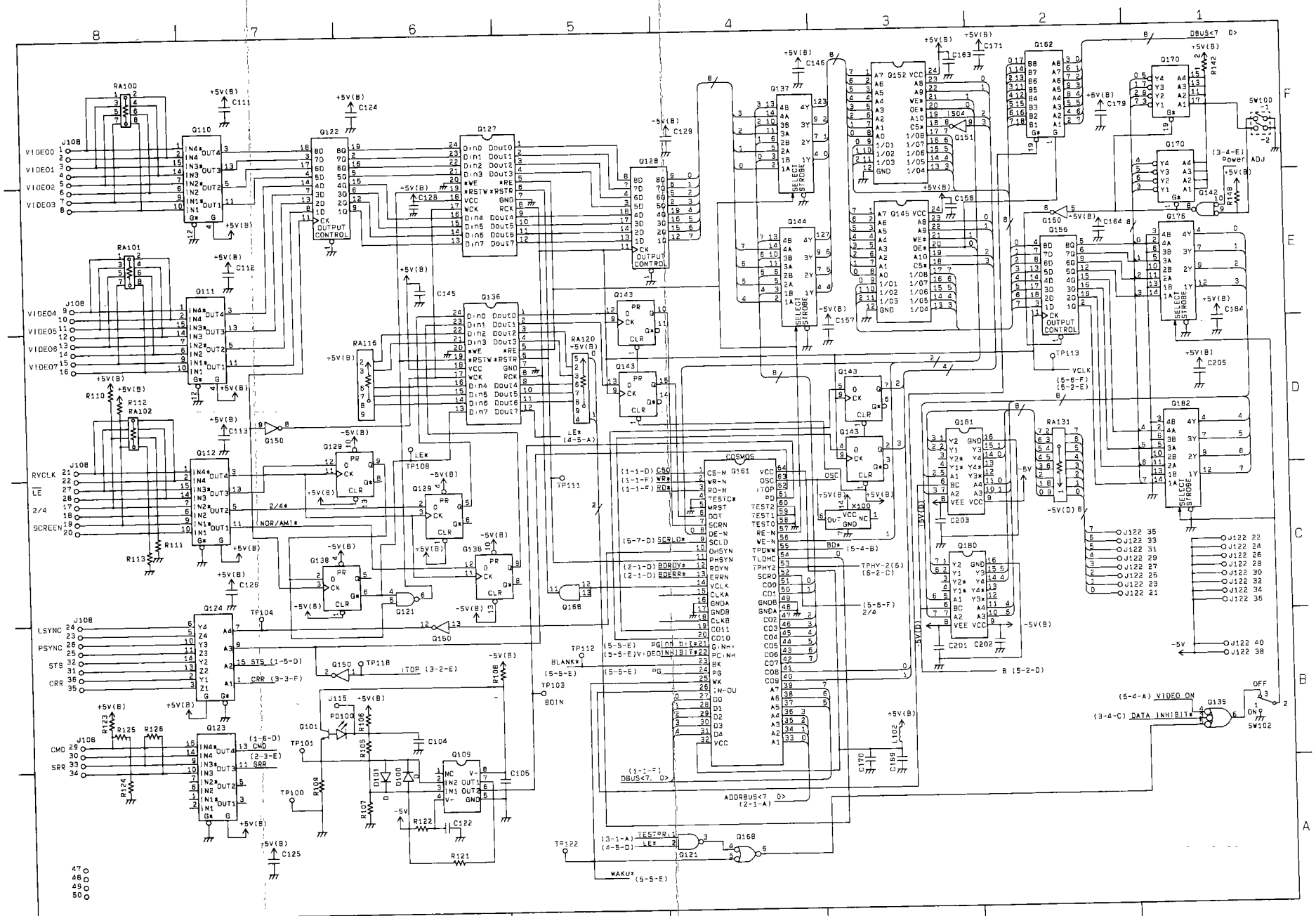
CLC500 DC controller circuit diagram (4/6)



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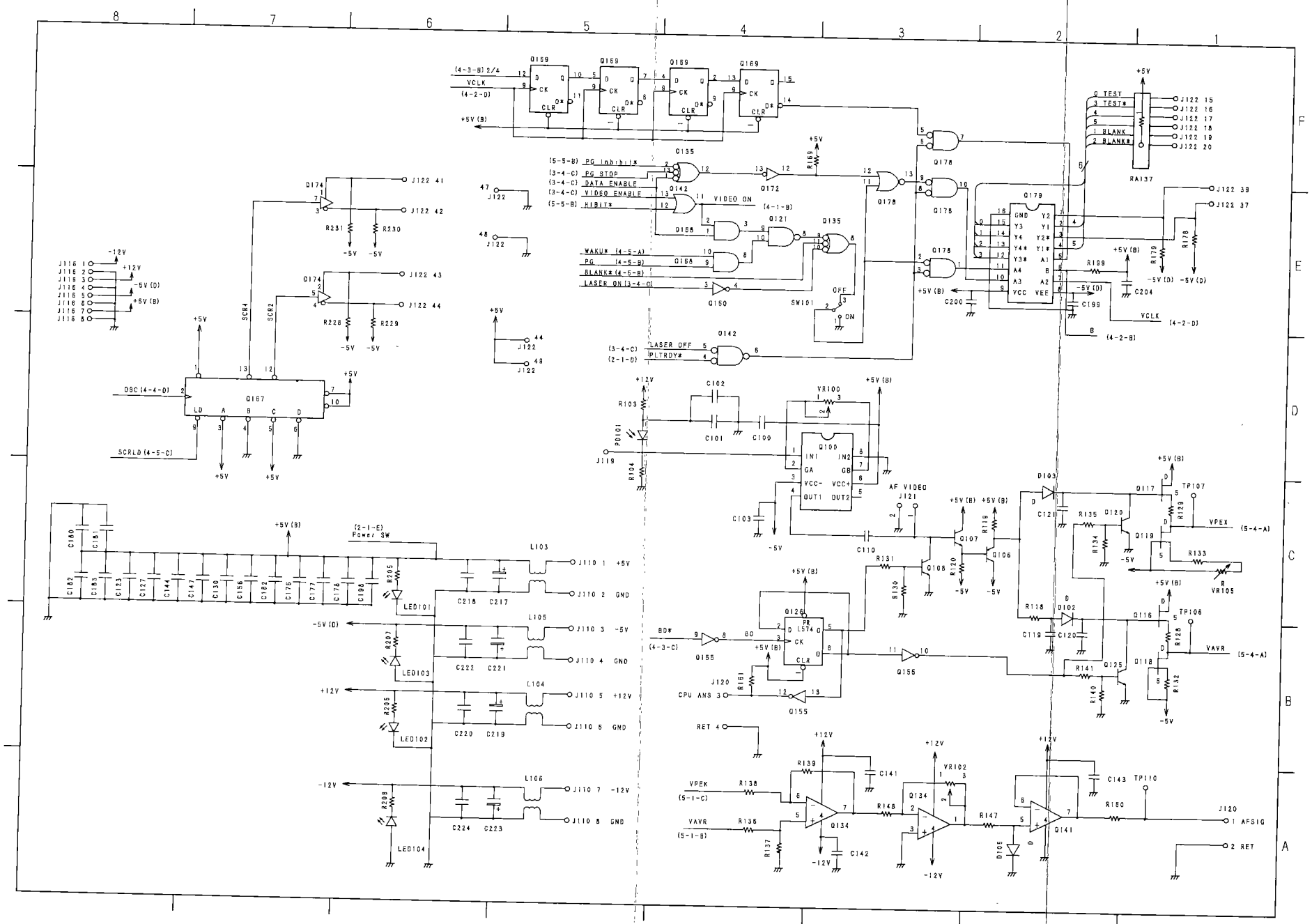

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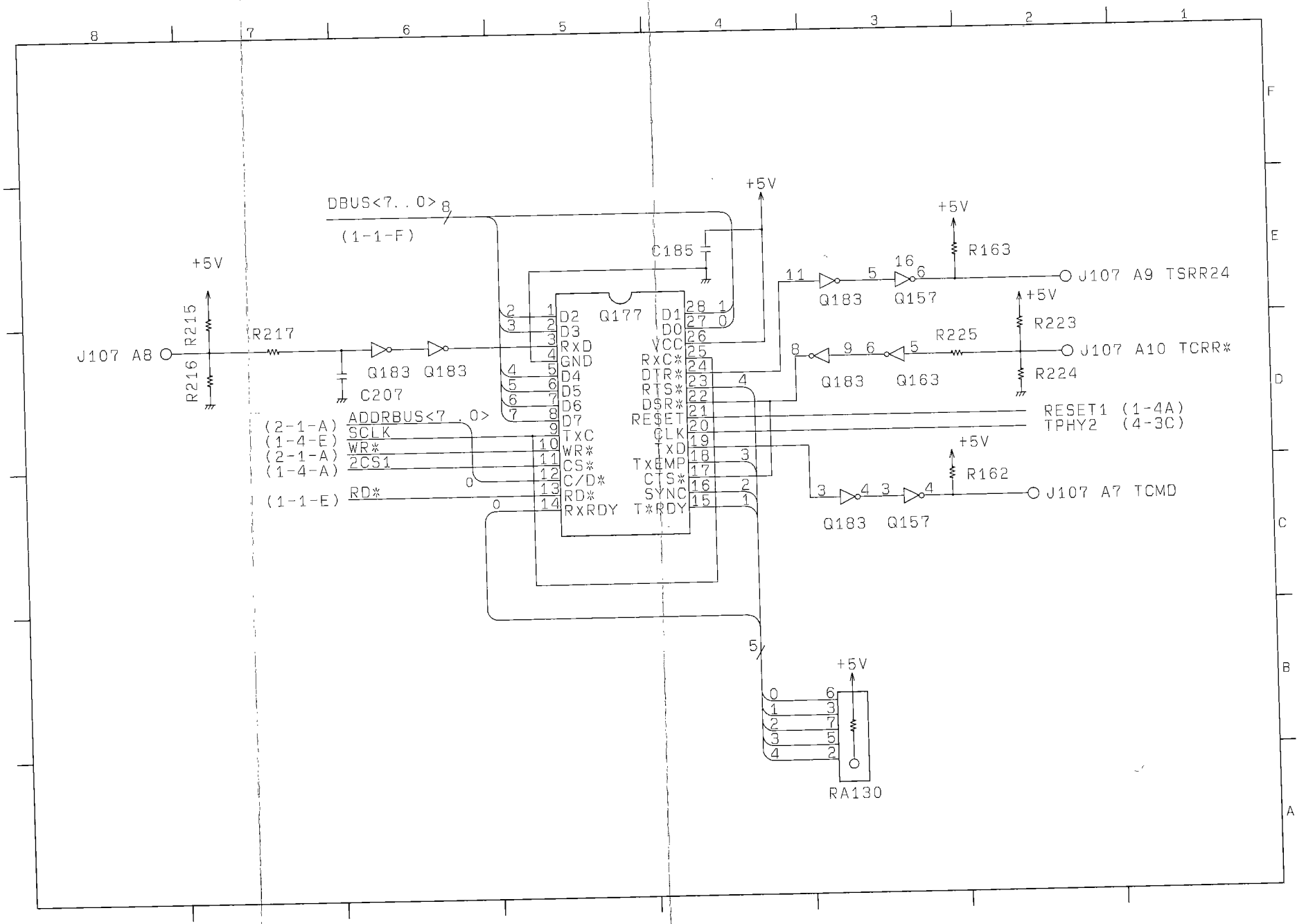

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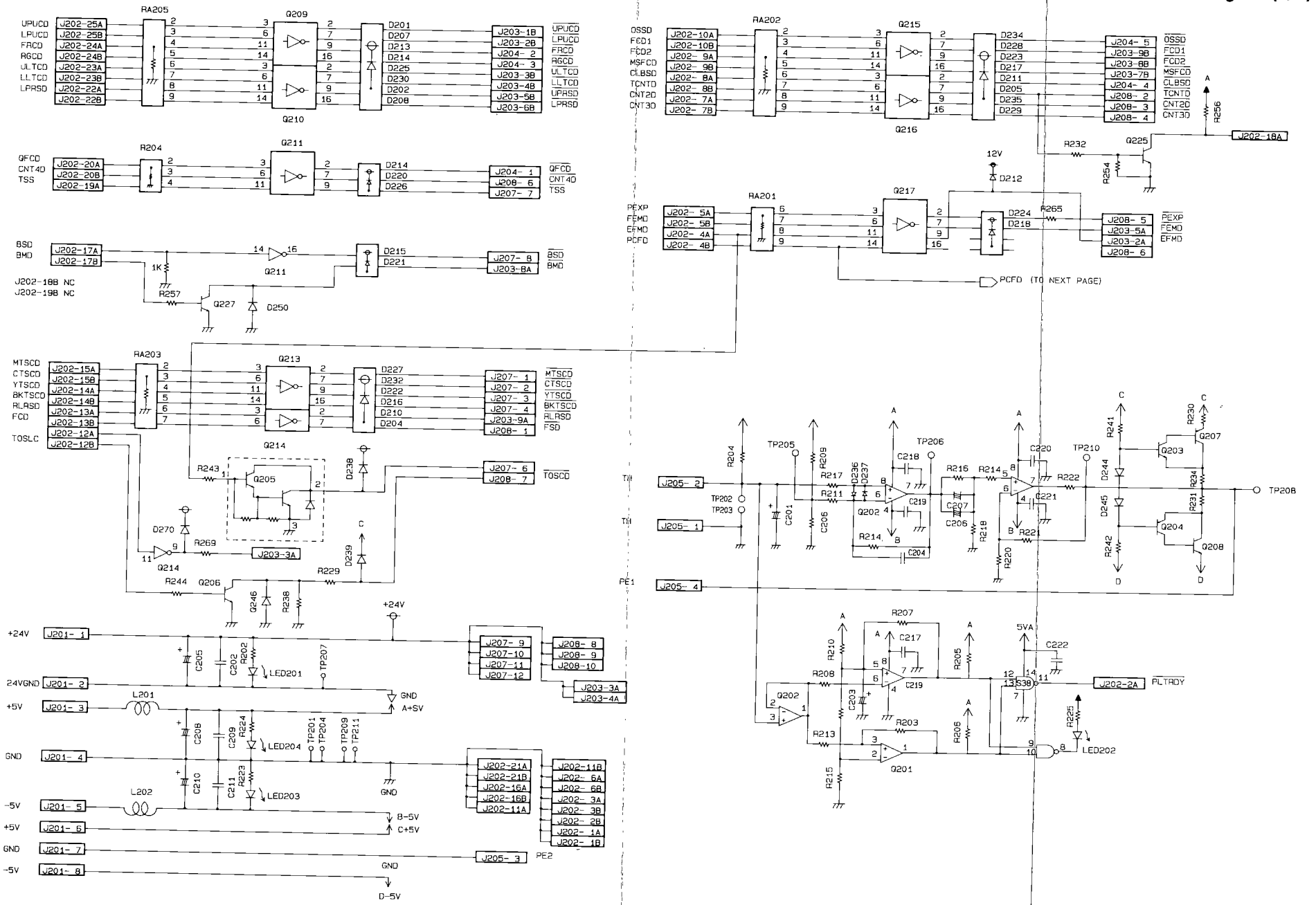
E. DC DRIVER CIRCUIT DIAGRAM

DC driver circuit diagram (1/2)



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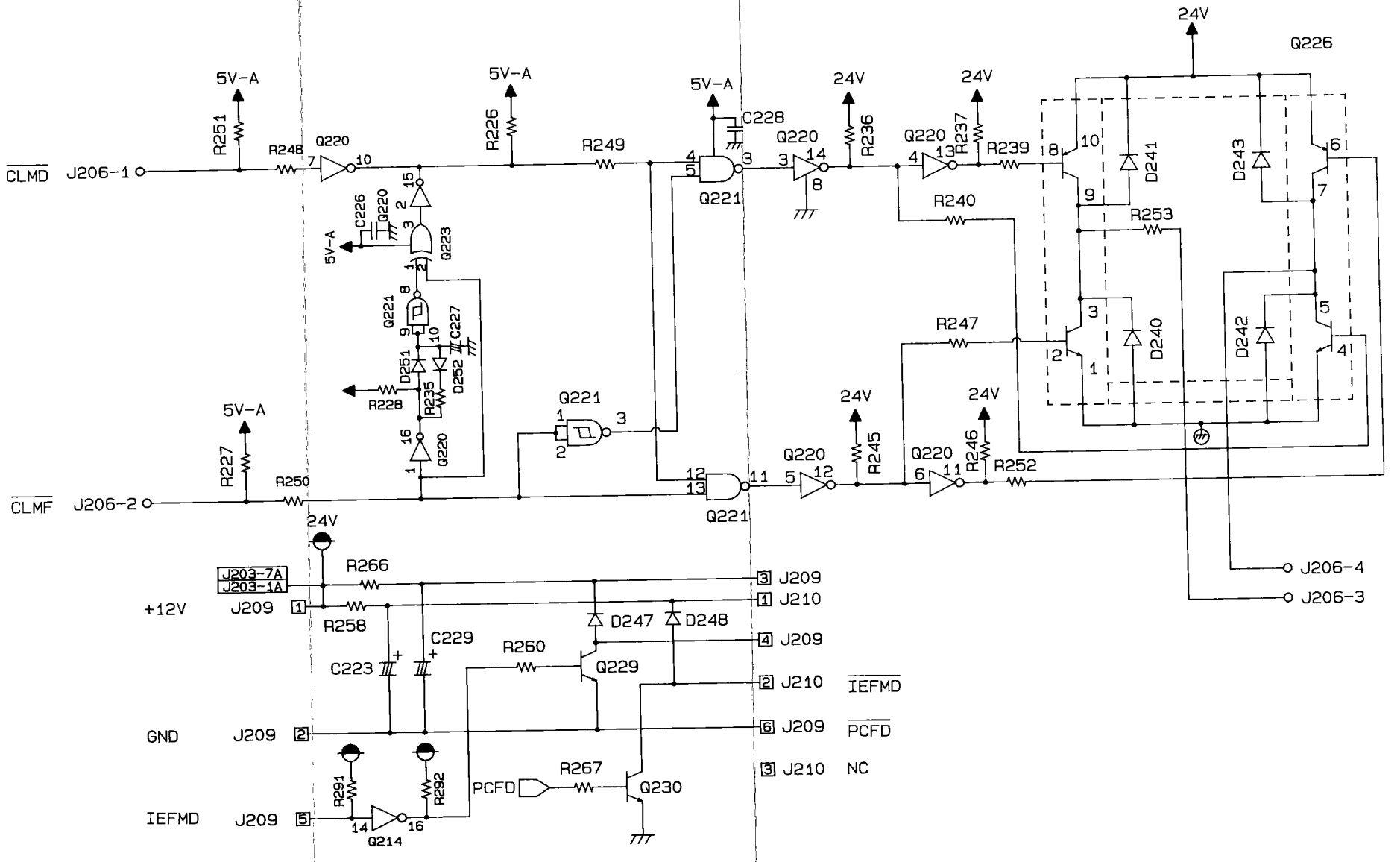
DC driver circuit diagram (2/2)



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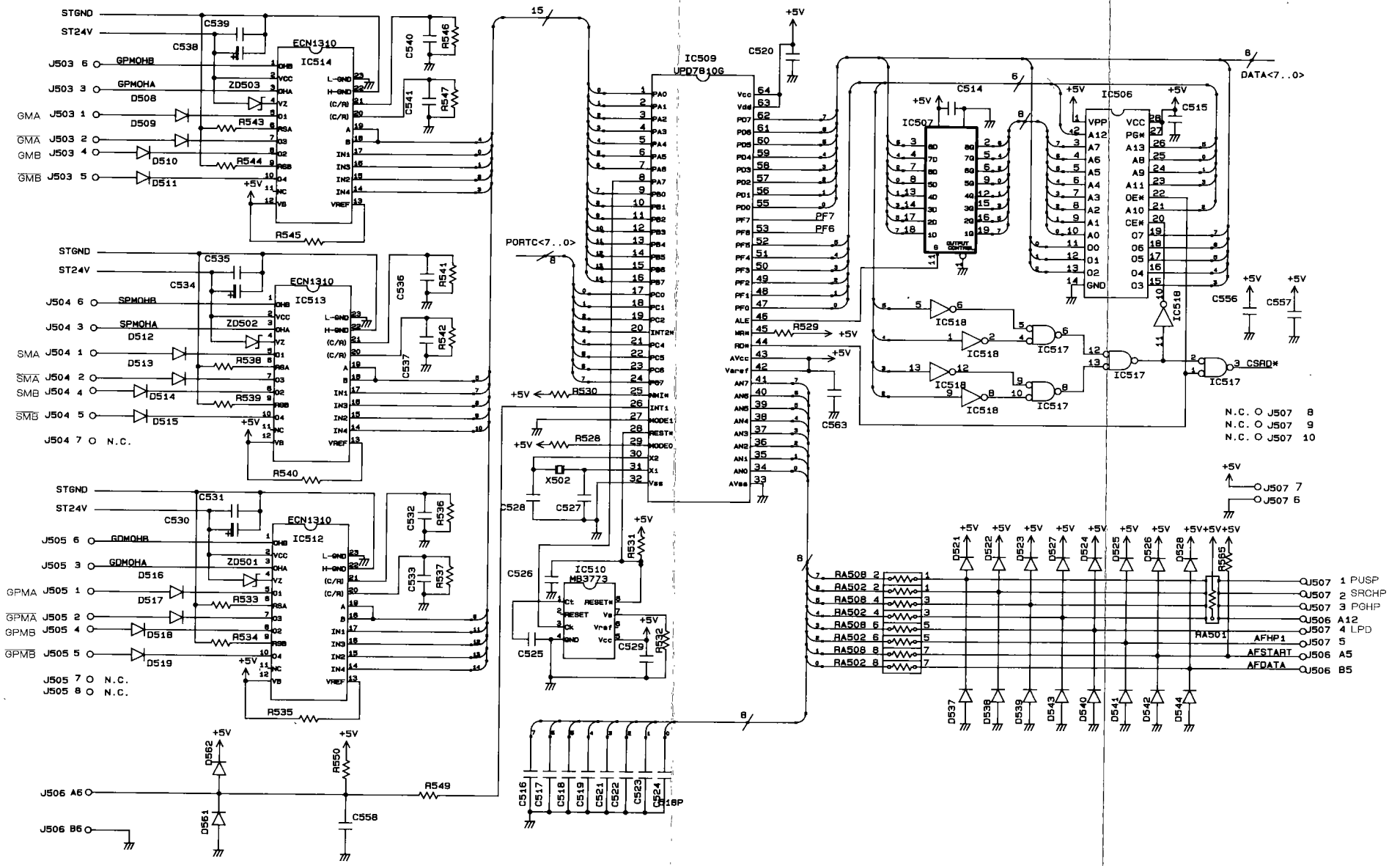
F. TRANSFER DRIVER CIRCUIT DIAGRAM

Transfer driver circuit diagram (1/3)



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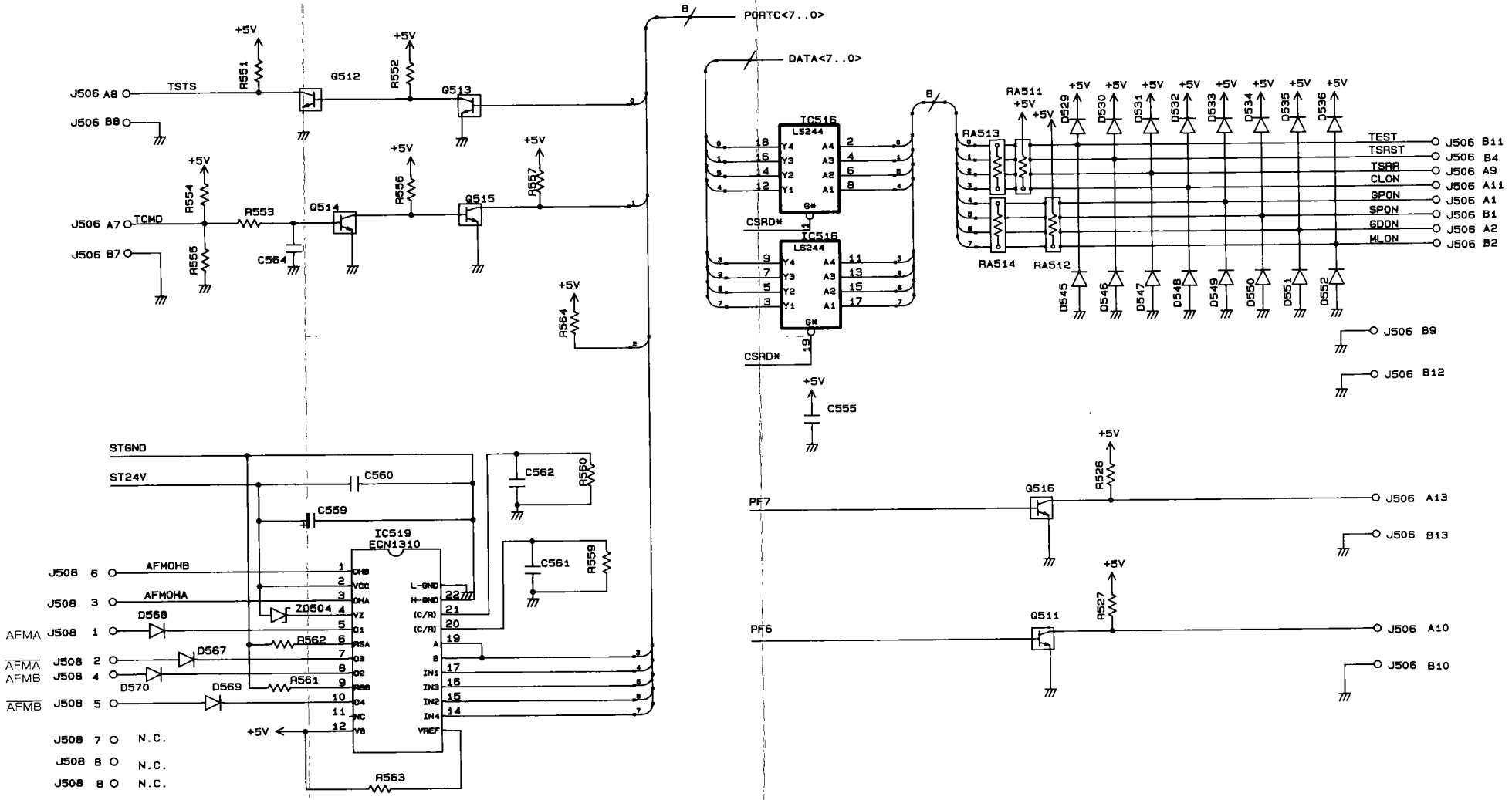
Transfer driver circuit diagram (2/3)



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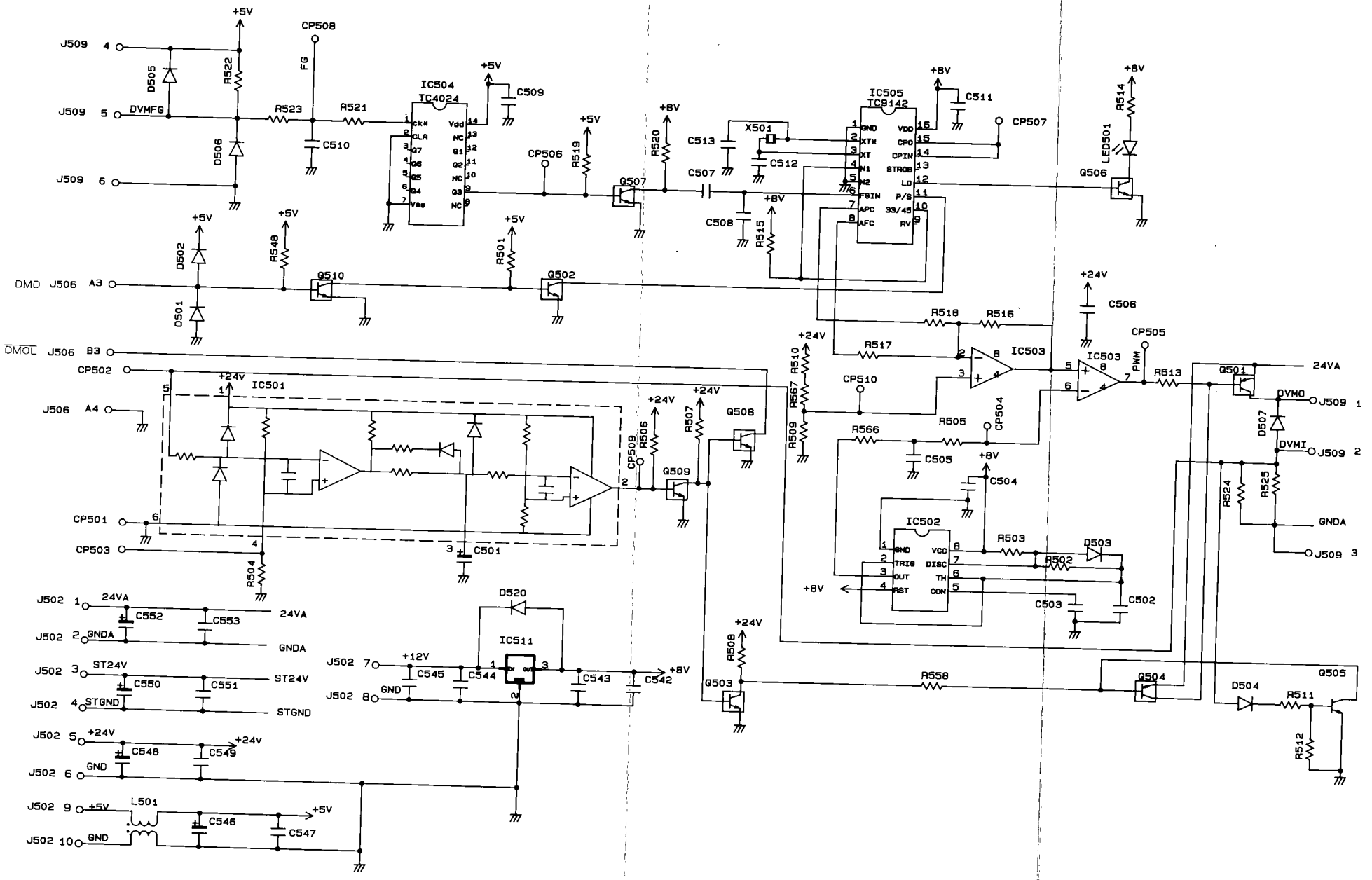

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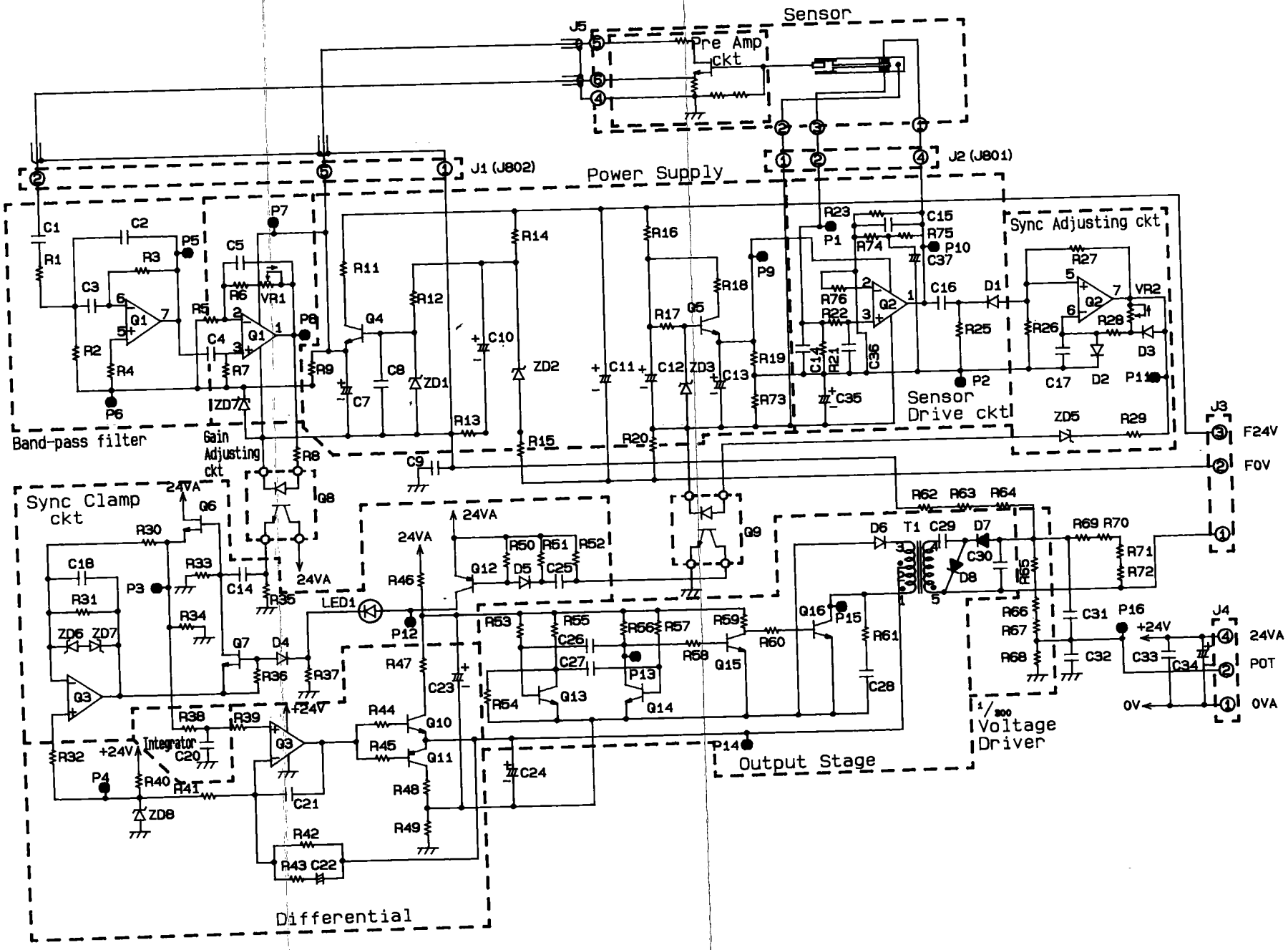
G. POTENTIAL MEASURING CIRCUIT DIAGRAM



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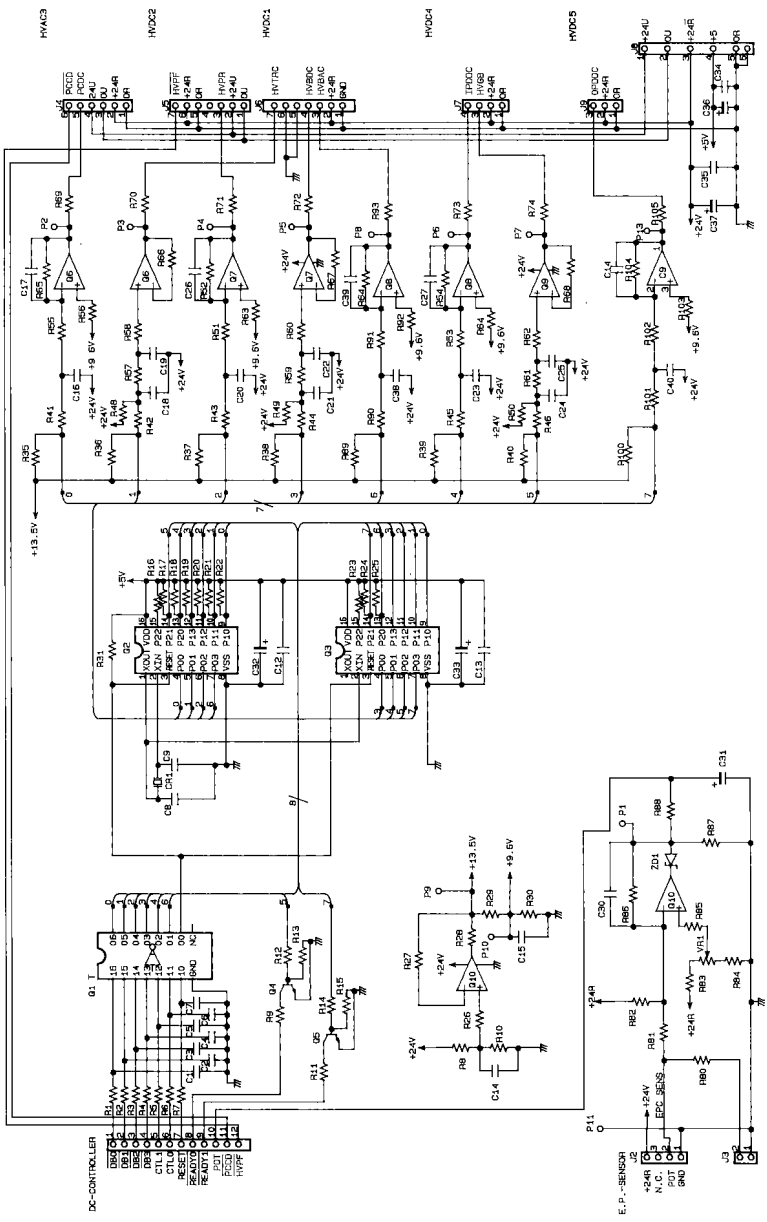
H. POTENTIAL CONTROL CIRCUIT DIAGRAM



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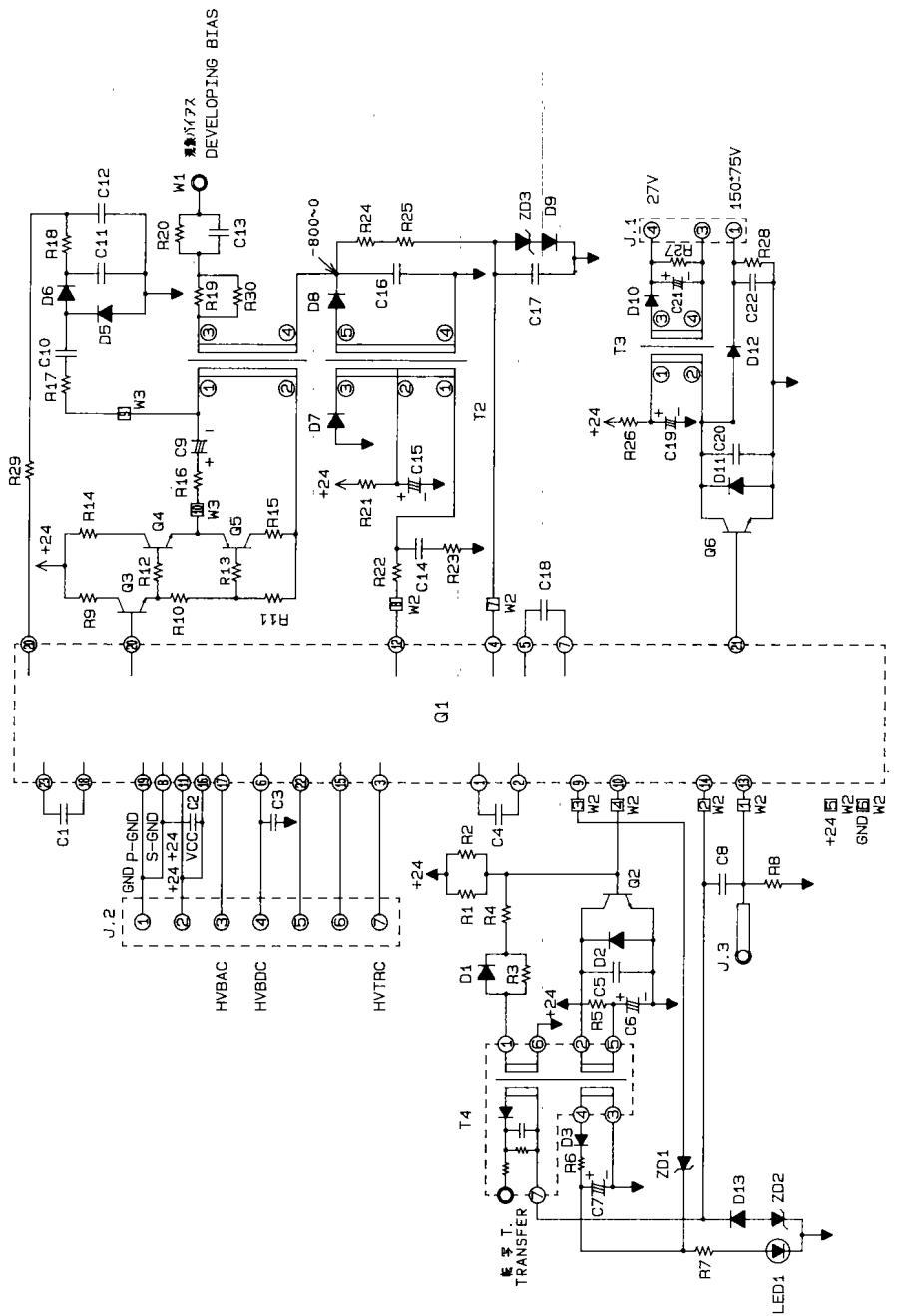
I. HVT-DC1 CIRCUIT DIAGRAM



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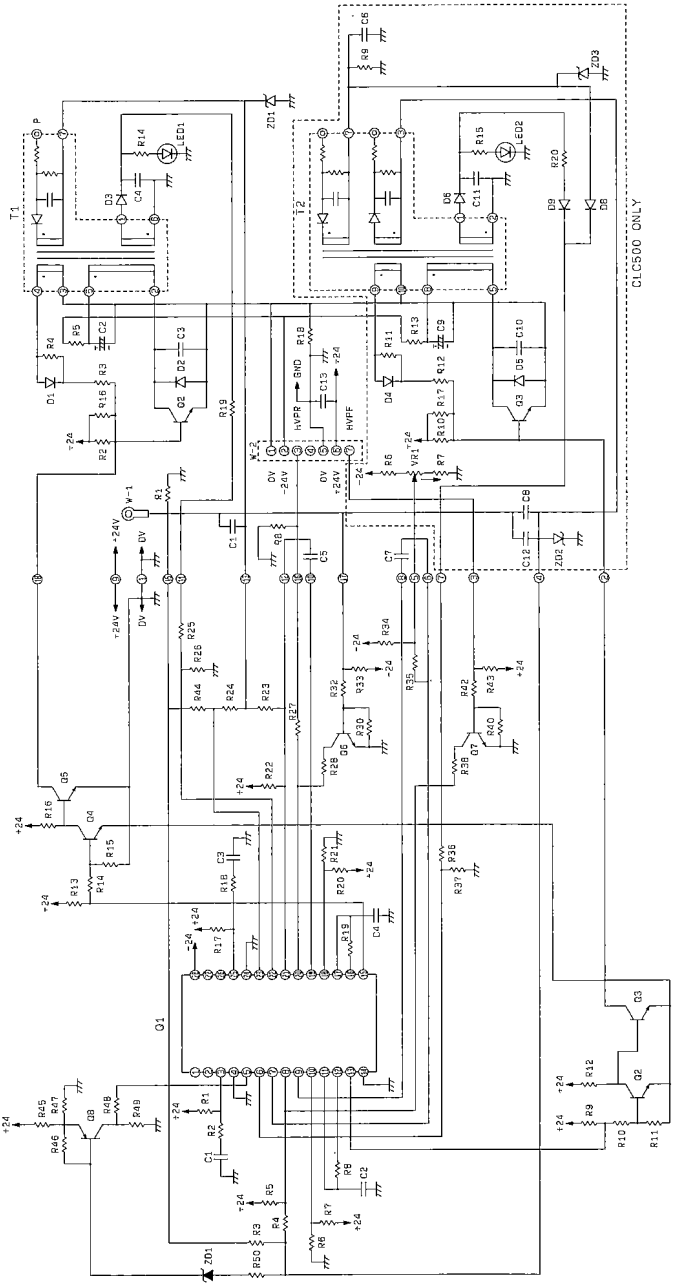
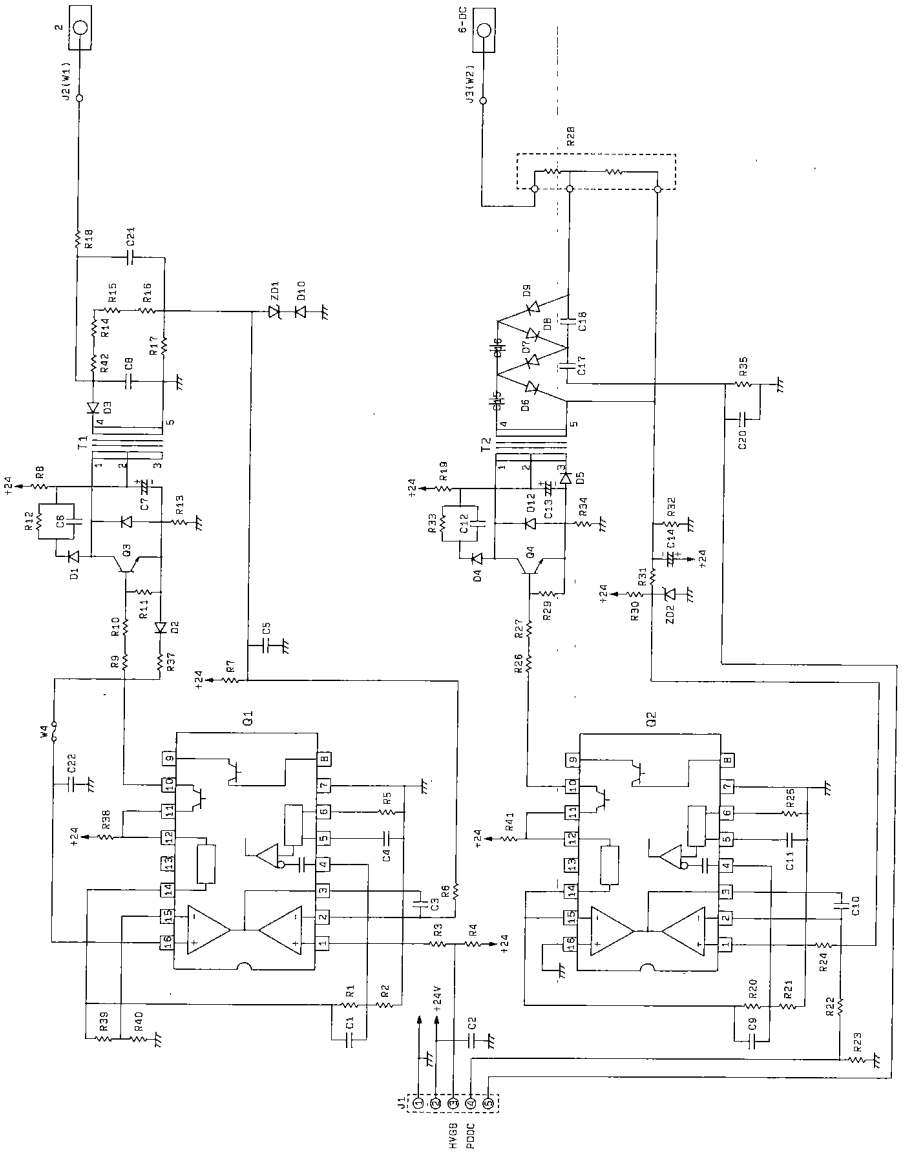
J. HVT-DC2 CIRCUIT DIAGRAM



K. HVT-DC4 CIRCUIT DIAGRAM



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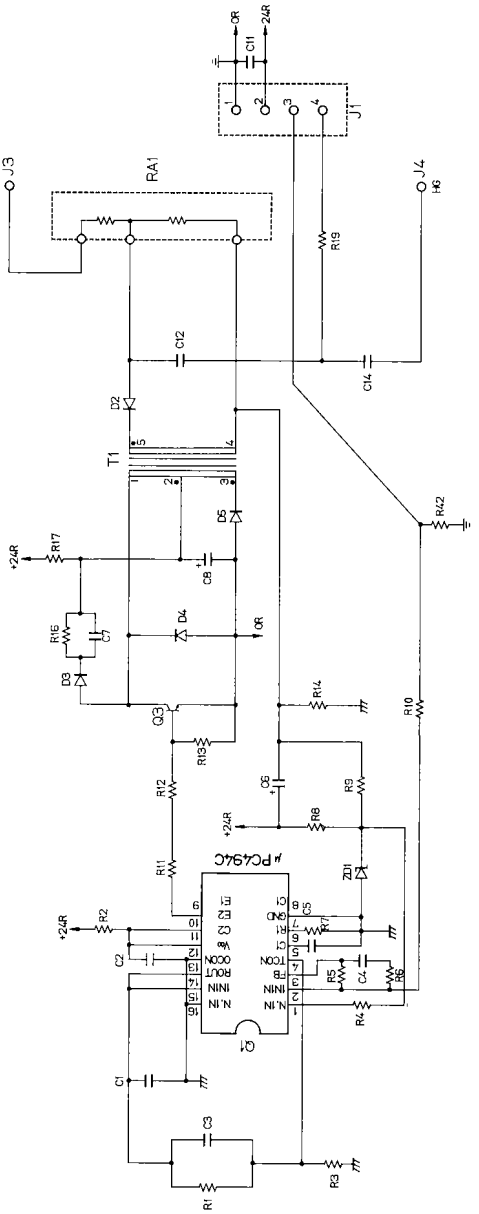
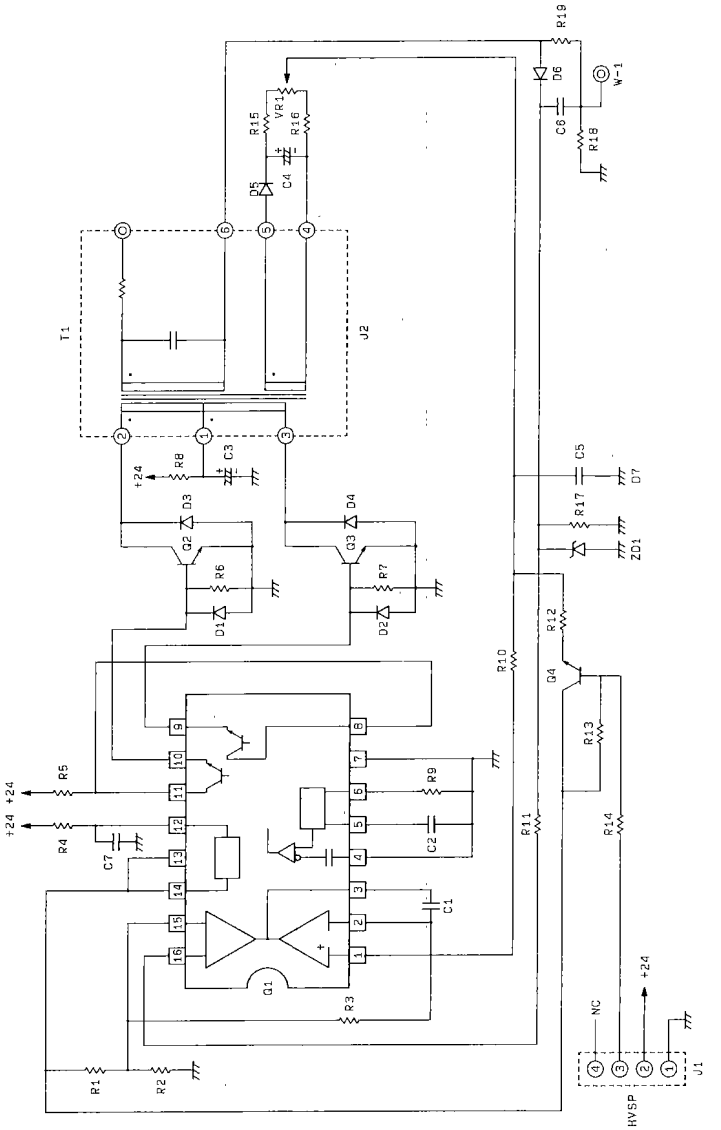
L. HVT-DC5 CIRCUIT DIAGRAM



M. HVT-AC1 CIRCUIT DIAGRAM



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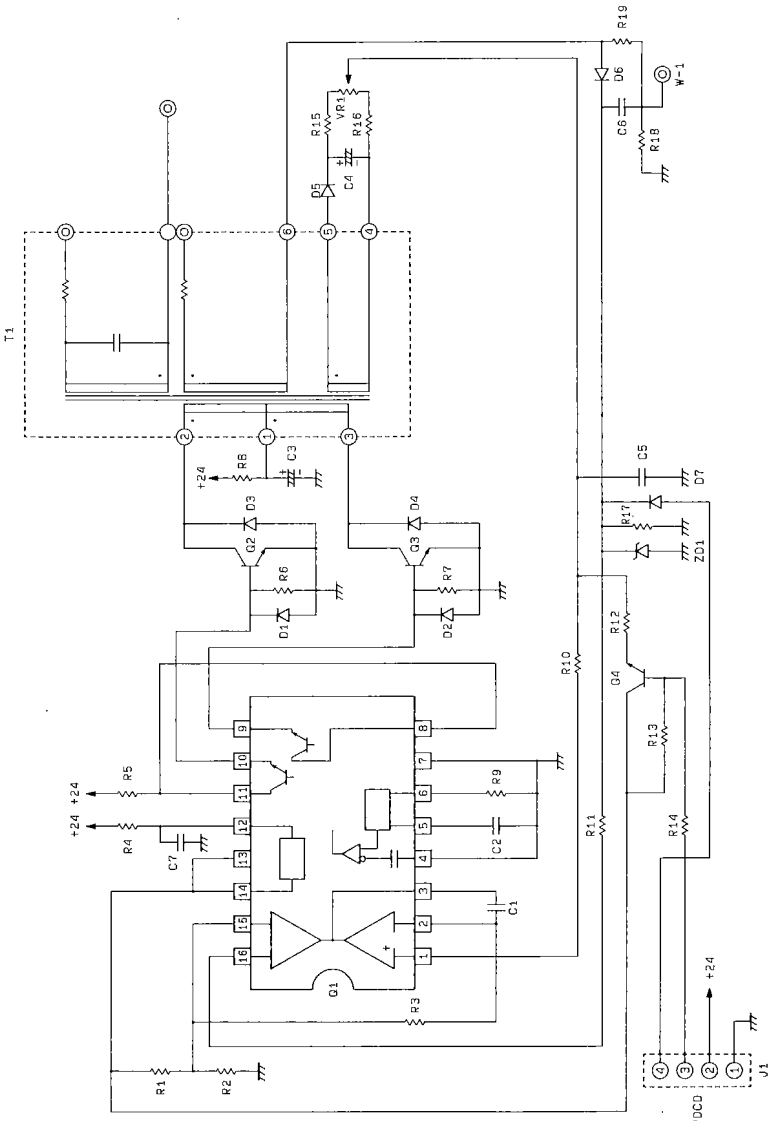
N. HVT-AC2 CIRCUIT DIAGRAM



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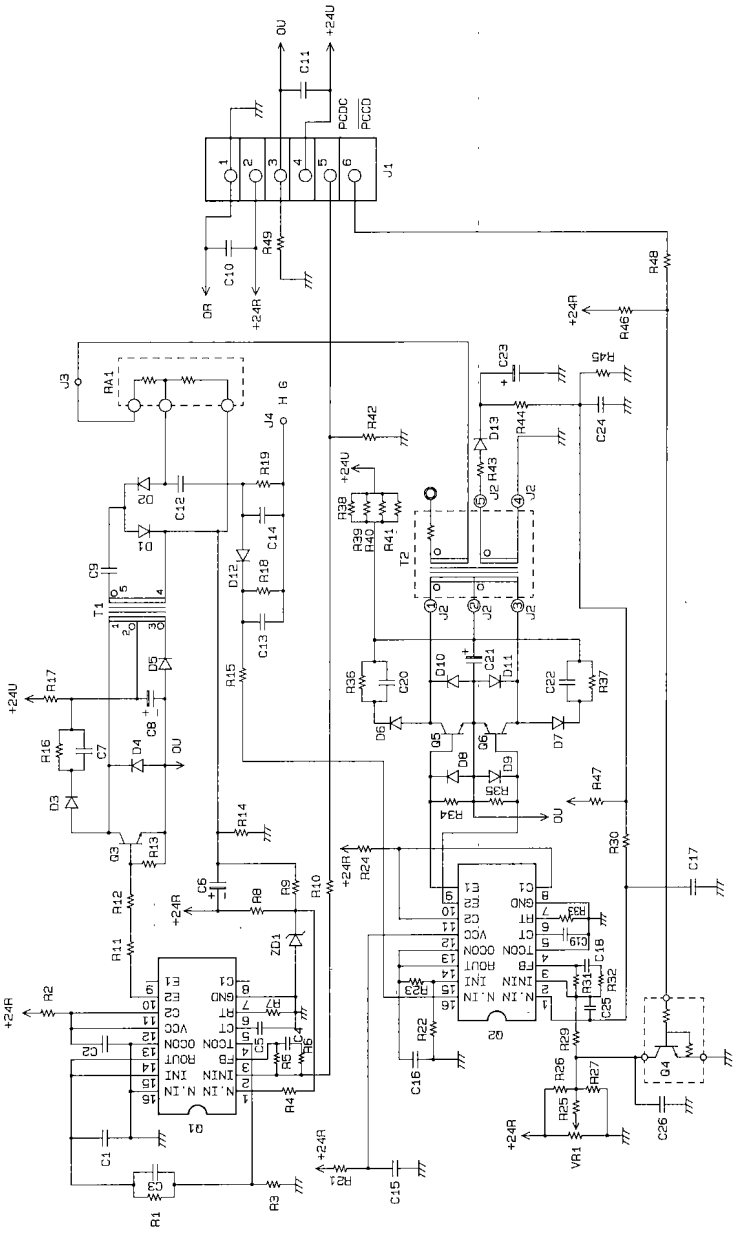
O. HVT-AC3 CIRCUIT DIAGRAM



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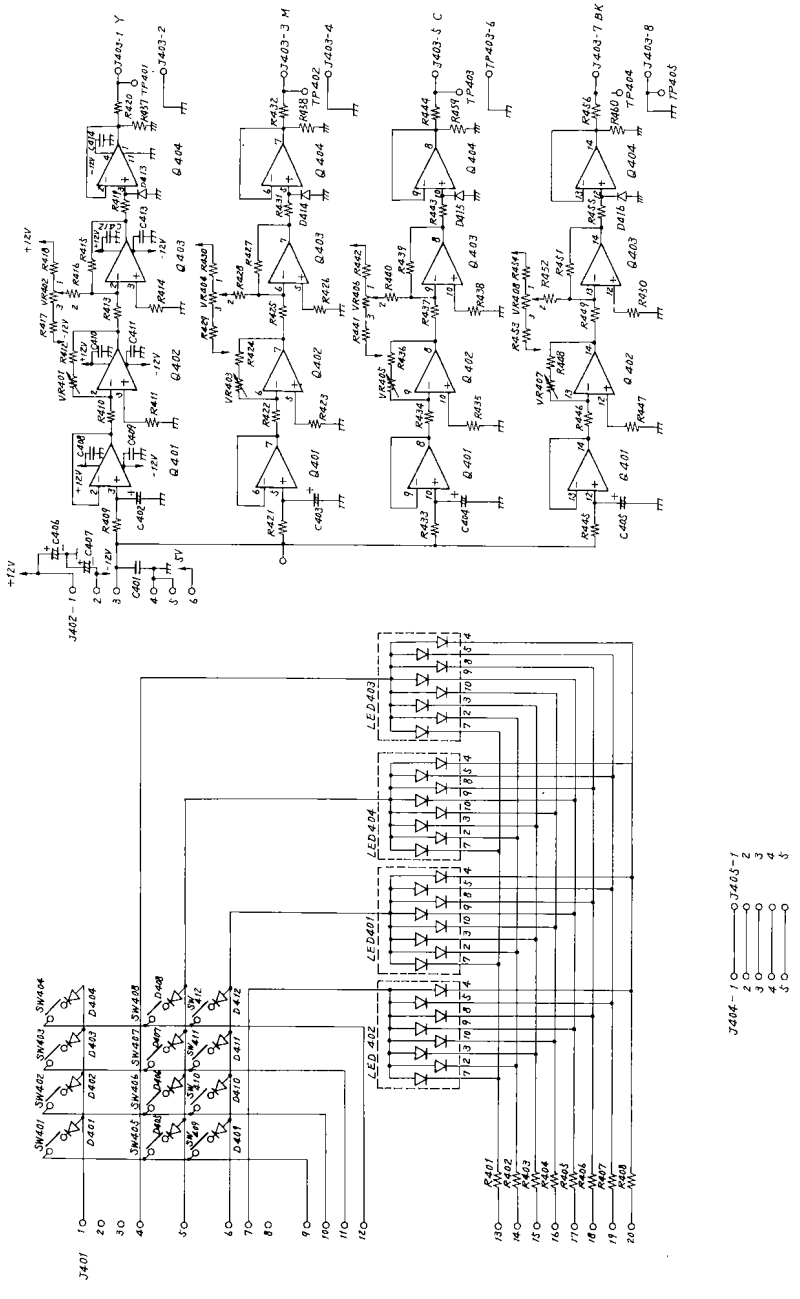
P. DISPLAY CIRCUIT DIAGRAM



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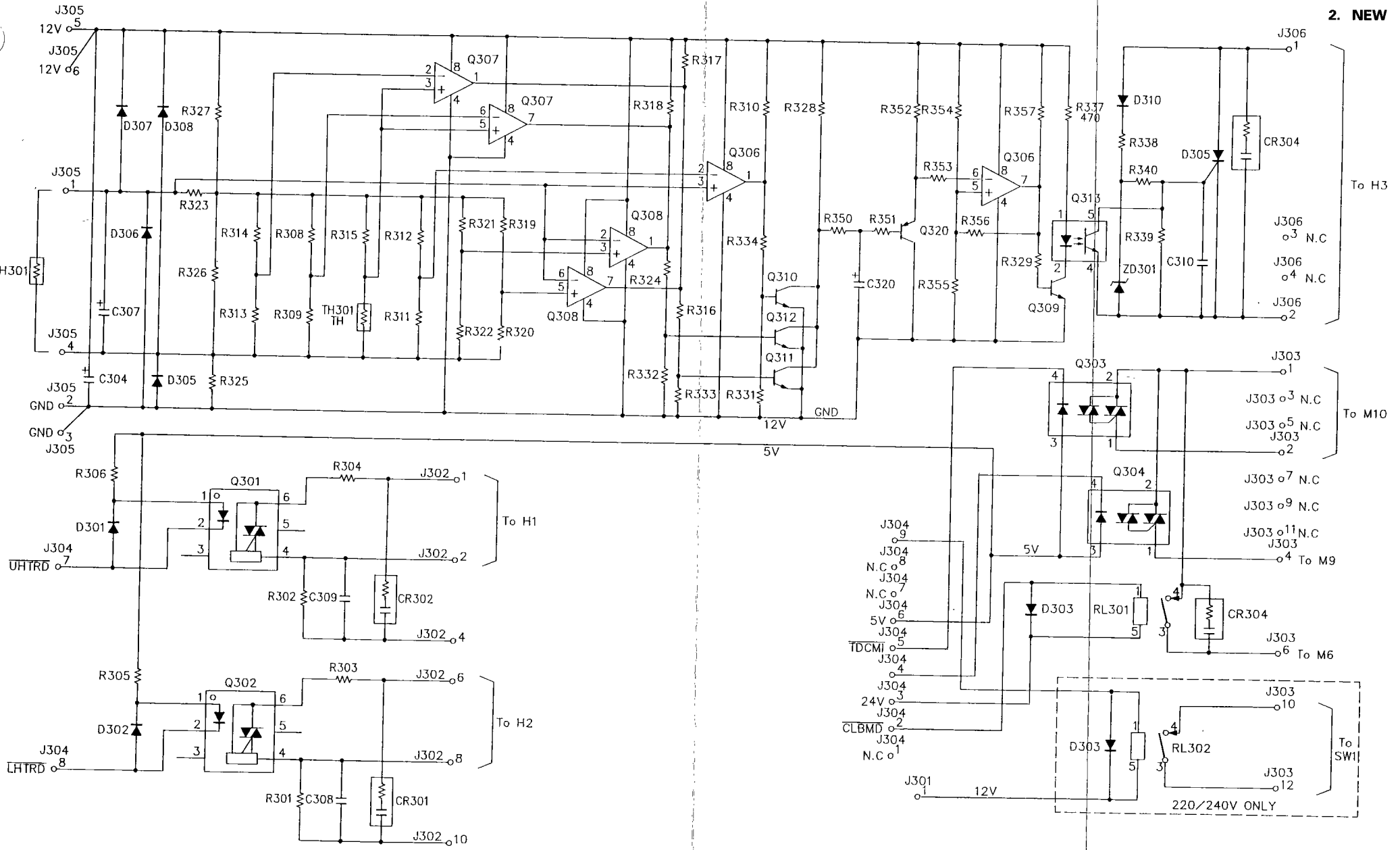

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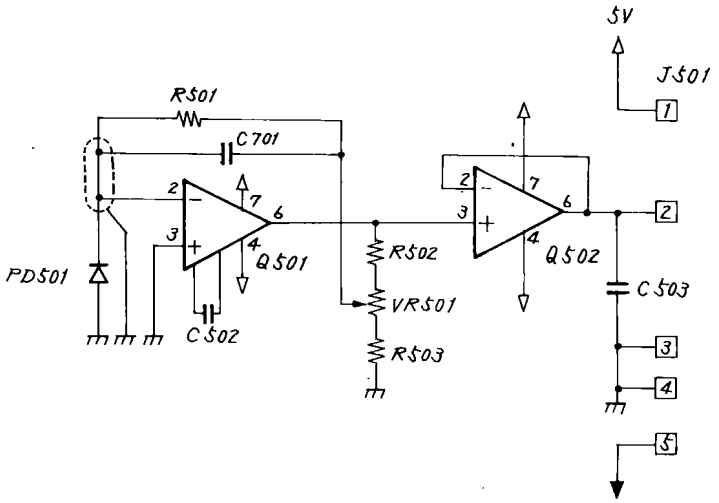
R. TONER CONCENTRATION SENSOR CIRCUIT DIAGRAM



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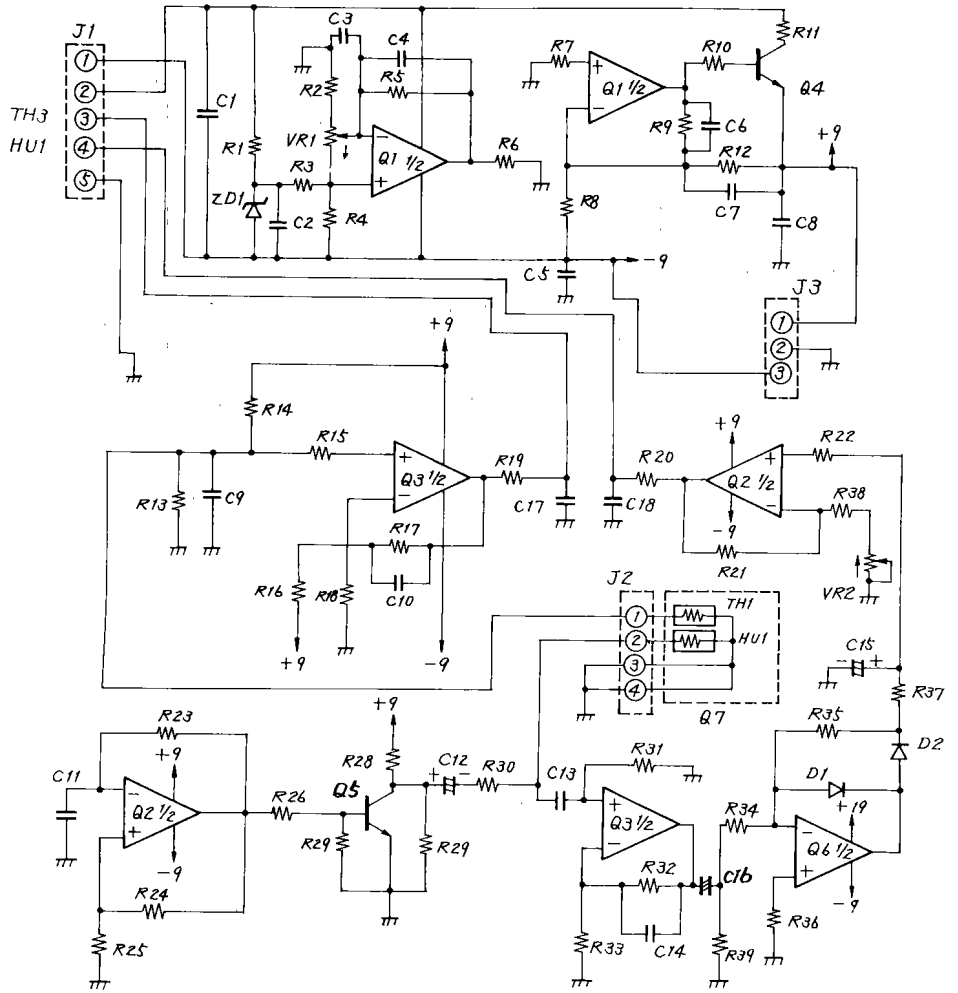
S. ENVIRONMENT MEASUREMENT CIRCUIT DIAGRAM



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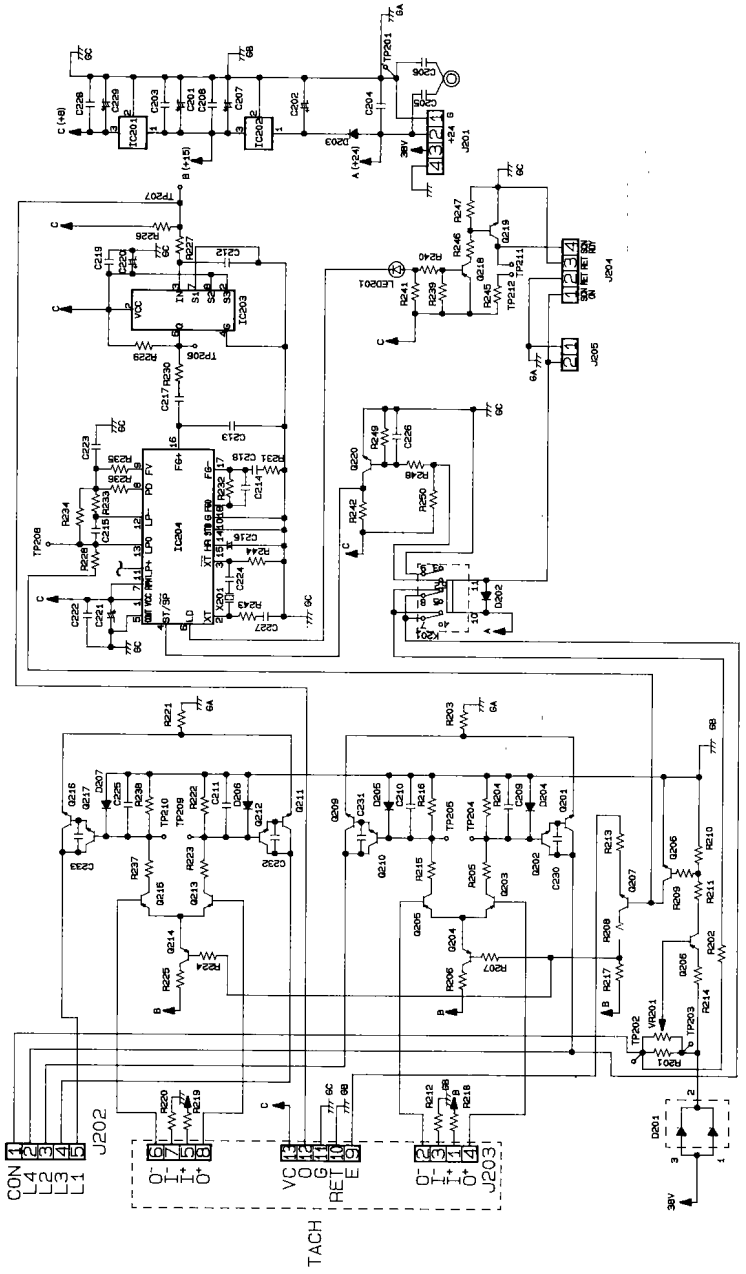
T. SCANNING MIRROR MOTOR DRIVE CIRCUIT DIAGRAM



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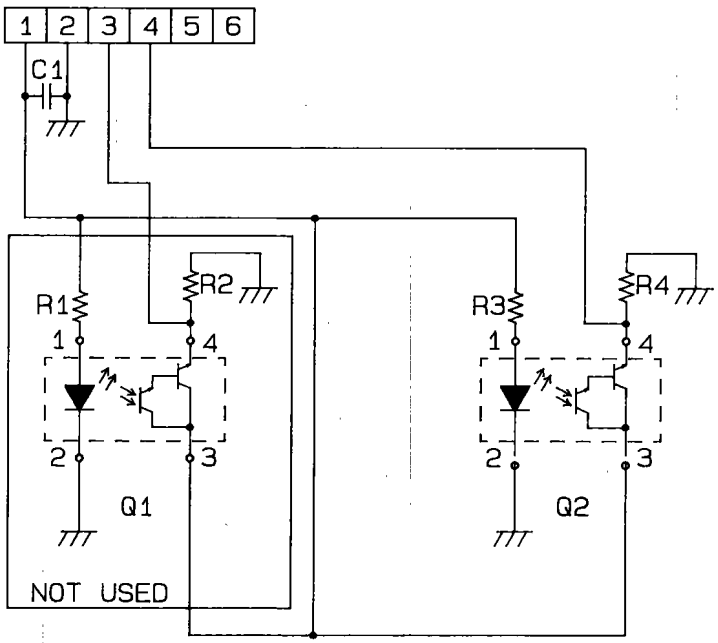
U. AF SENSOR CIRCUIT DIAGRAM



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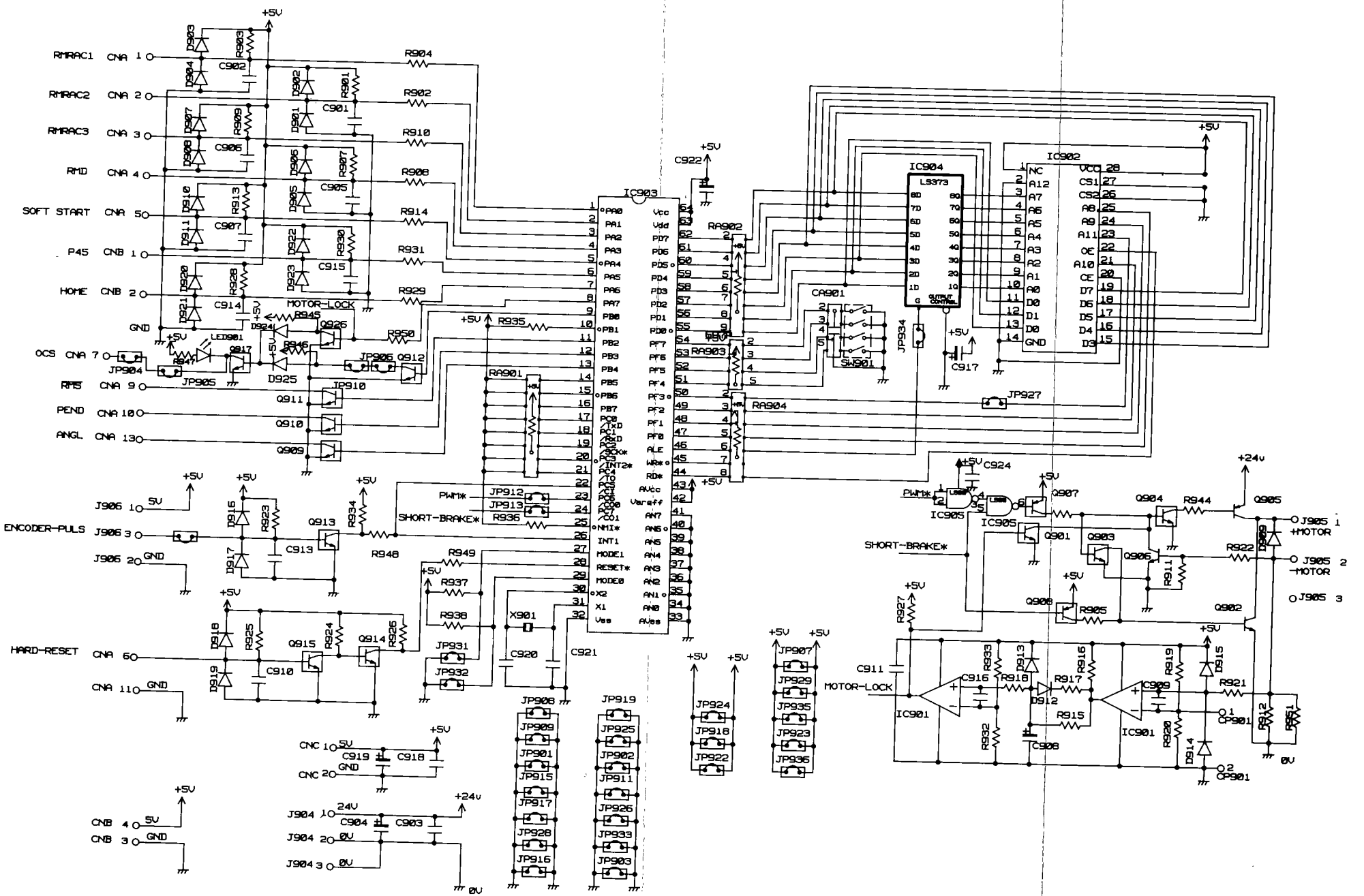

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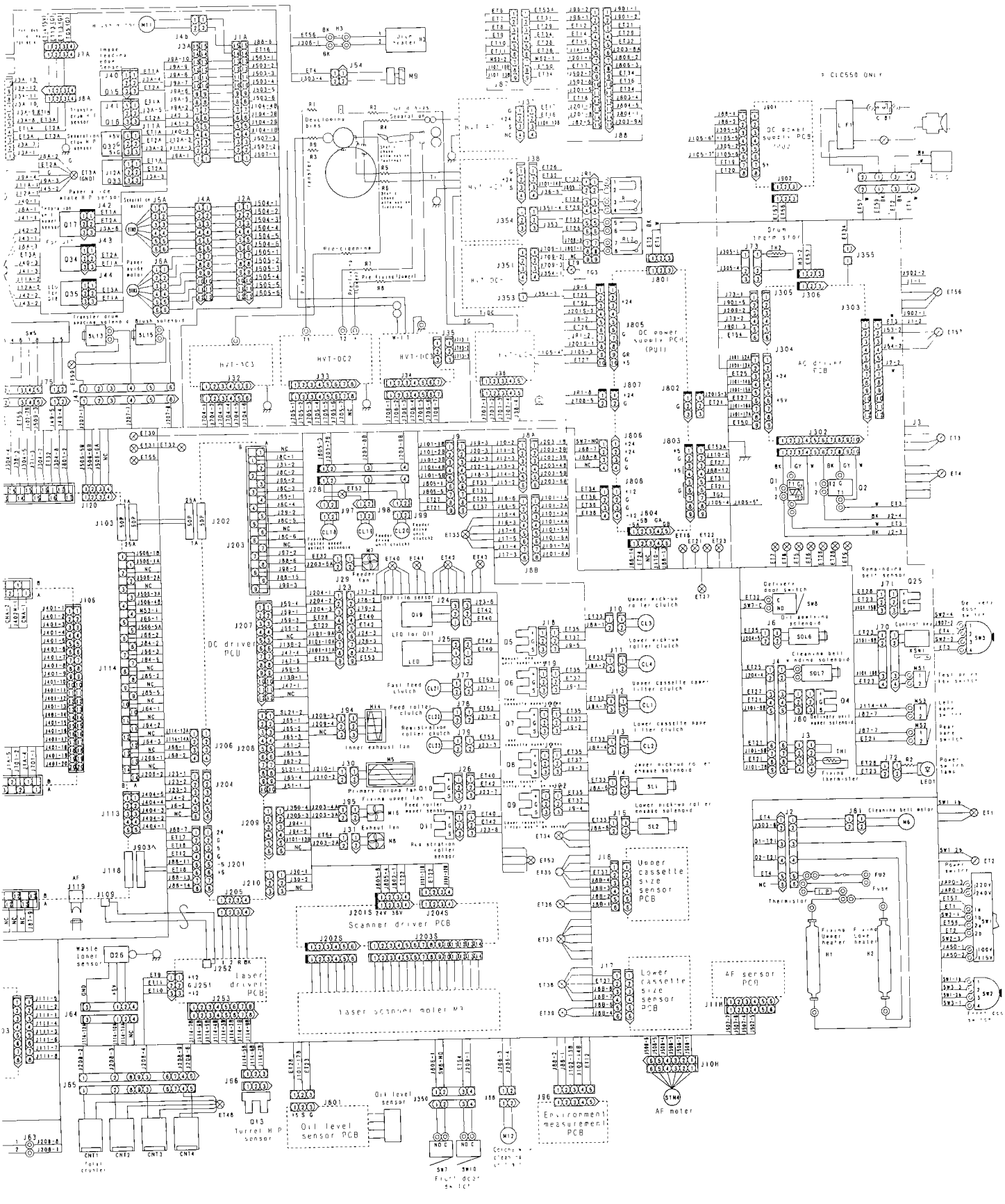
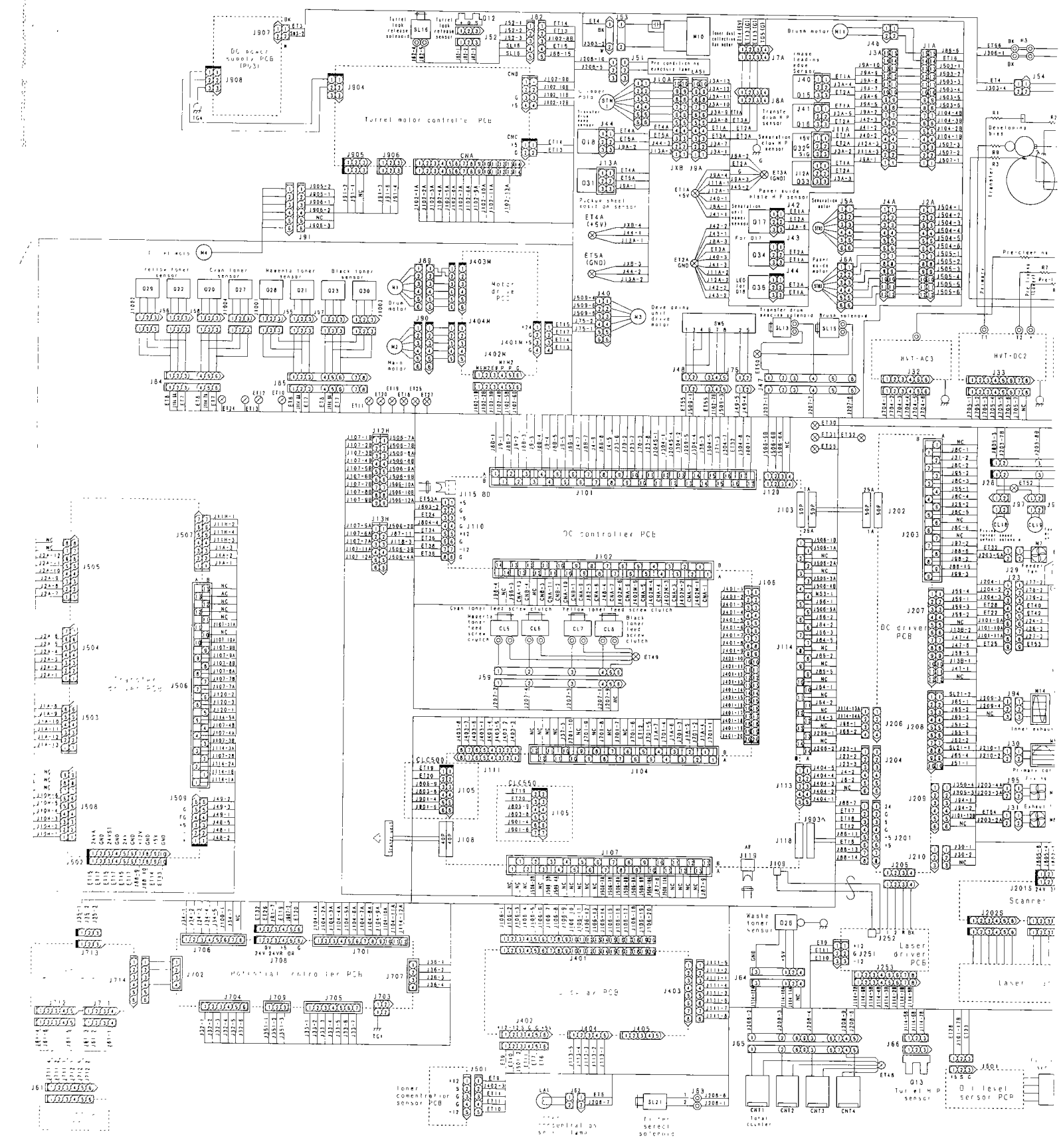
W. GENERAL WIRING DIAGRAM

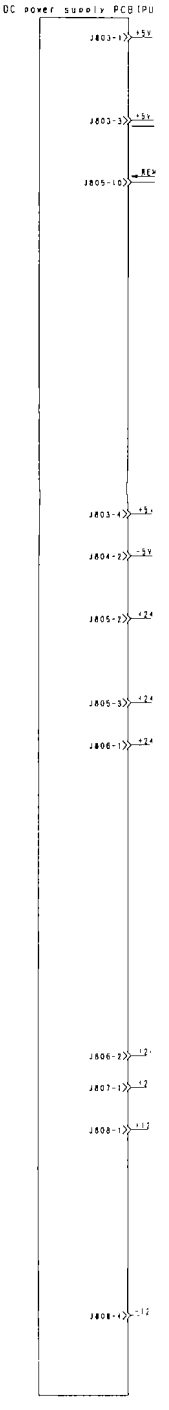



DC power supply PCB (PU3)
Turret motor controller PCB
DC controller PCB
DC driver PCB
Laser driver PCB
Scanner
Toner concentration sensor PCB
Toner end sensor PCB
Waste toner sensor
Toner collection box motor
Brush motor
Image leading edge sensor
Transfer drum H.P sensor
Separation claw H.P sensor
Paper guide plate H.P sensor
Separation motor
Fan
Paper guide motor
Transfer drum pressure solenoid
Brush solenoid
Pre-charger motor
Developing bias
Transfer
Primary
Pre-transfer charger
Pre-charger
Yellow toner sensor
Cyan toner sensor
Magenta toner sensor
Black toner sensor
Drum motor
Main motor
Motor drive PCB
Developing unit drive motor
Yellow toner feed screw clutch
Cyan toner feed screw clutch
Magenta toner feed screw clutch
Black toner feed screw clutch
Turret motor
Turret lock release solenoid
Turret lock release sensor
Toner collection box sensor
Pre-condition exposure lamp
Primary corona
Picture sheet assist on sensor
Developing unit drive motor
HVT-AC3
HVT-DC2
Toner level sensor PCB
Toner level sensor
Toner end sensor
Toner concentration sensor
Total counter
Fuser separation solenoid
Fuser separation lamp

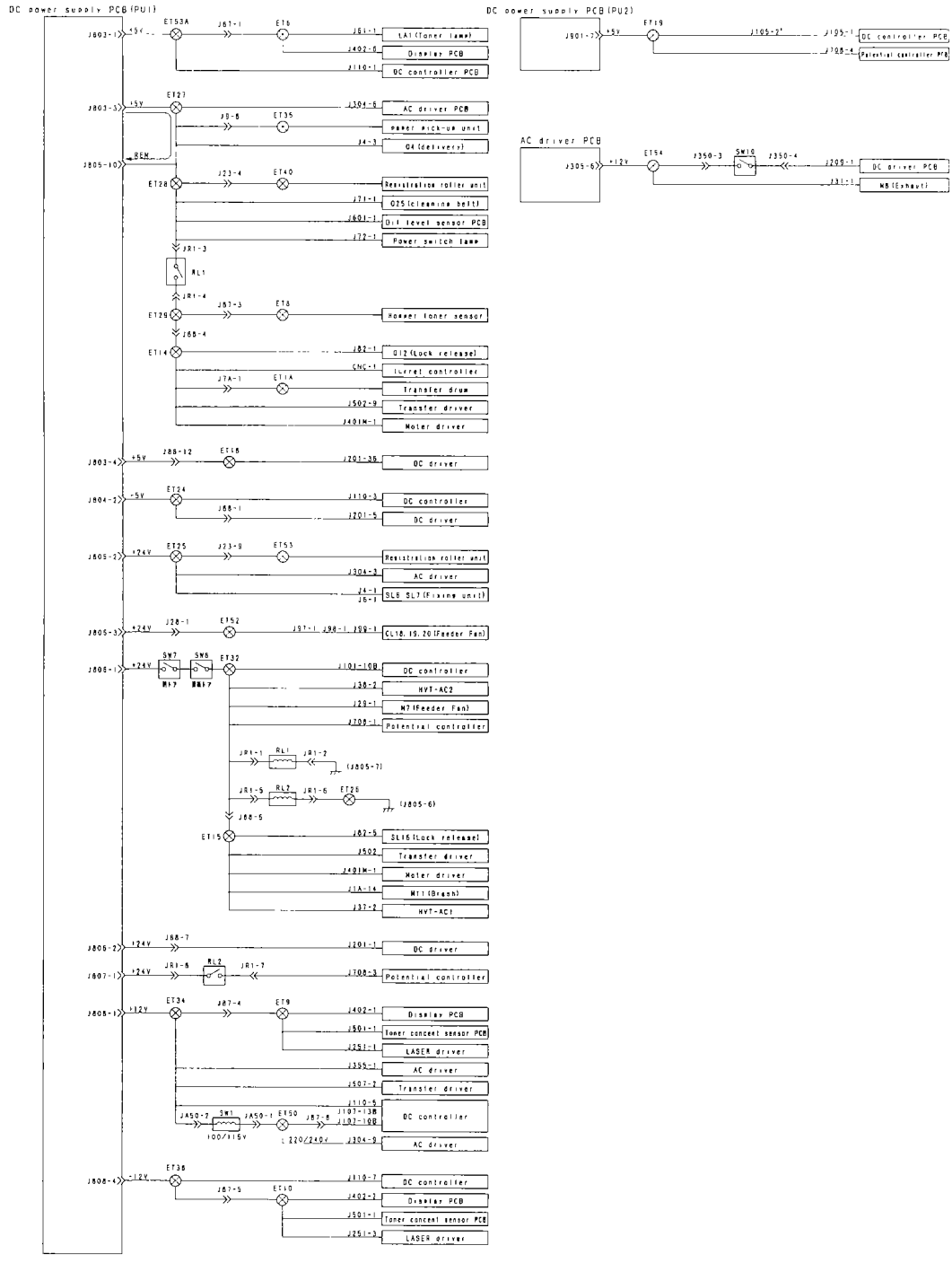
ET TABLE

* CLC550 ONLY

No	ET No	CONNECTOR	No	ET No	CONNECTOR	No	ET No	CONNECTOR	No	ET No	CONNECTOR	No	ET No	CONNECTOR	No	ET No	CONNECTOR	No	ET No	CONNECTOR
1	ET1 AC(W) 110/115V	J1-4 J801-2 SW1-LINE2	8	ET-9 (12V)	J402-1 J501-1 J251-1 J87-4	16	ET17 (GND)	J37-1 J502-2 J602-4 J502-6 J401M-2 J201-2 J88-8	24	ET-25 (24V)	J23-9 J304-3 J4-1 J6-1 J805-2	32	ET-33 (24V) (駆動) (Paper Pick-up Unit)	J9-6 J10-1 J11-1 J12-1 J13-1 J14-1 J15-1	40	ET-48 (24V) (カウンタ) (Counter Unit)	J65-4 CNT1 CNT2 CNT3 CNT4	48	ET56 AC(BK) 100/115V	J1-1 J802-2 SW1-LINE3 H3-1
	ET1 AC(W) 220/240V	J1-4 J801-2 SW1-LINE2 J303-10	9	ET-10 (-12V)	J402-2 J501-5 J251-3 J87-5	17	ET-18 (5V)	J201-3 J201-6 J88-12	25	ET-26 (GND)	J38-1 J805-8 J708-2 J8-6 TG3 J805-10	33	ET-34	J808-1 J355-1 J110-5 J87-4 J87-8 J88-9 JAS0-2	41	ET-49 (24V) (ドライブ駆動) (Paper Drive Unit)	J59-5 SL17-1 SL18-1 SL19-1 SL20-1		ET56 AC(BK) 220/240V	J1-1 J802-2 SW1-LINE3 H3-1 J305-4 JAP0-1
2	ET2 AC(BK)	J1-3 J801-1 SW1-LINE4	10	ET-11 (GND)	J402-4 J501-3 J501-4 J251-2 J87-6	18	ET-19 (5V)	J105-1 J201-7 J708-4 J105-2'	26	ET-27 (5V)	J304-6 J9-8 J4-3 J803-3 J805-10 ET-28	34	ET-35 (5V) (駆動) (Paper Pick-up Unit)	J9-8 J10-1 J10-1 J20-1 J21-1 J22-1	42	ET-50 (12V)	JAS0-1 J304-9 J87-8	49	ET57 AC(W)	J1-2 J306-2 J802-1 SW1-LINE1
3	ET3 AC(W)	J303-1 J907-1 D1-T11 Q7-T-1 SW3-4	11	ET12 GND	J95-5 J104-5B J154-1 J201-4 J88-3 ET-13	19	ET-20 (GND)	J901-8 J105-2 J708-6 J105-3'	27	ET-28 (5V)	J23-4 J71-1 J601-1 J72-1 J81-3 ET-27	35	ET-36 (GND)	J808-2 J808-3 J110-6 J110-8 J87-6 J88-10	43	ET-52 (24V)	J805-3 J87-1 J58-1 J59-1	50	ET-1A (5V) (転写ユニット) (Transfer Drum Unit)	J40-1 J41-1 J11A-1 J12A-1 J42-1 J43-1 J45-1 J8A-1 J9A-4
4	ET4 AC(BK)	J54-1 J2-1 J2-5 J53-1 SW3-2	12	ET13 GND	J82-2 CNC-2 J7A-2 J7A-3 J502-10 J401M-4 ET-12	20	ET-21 (GND)	J9-9 J4-4 J4-6 J4-8 J802-2 MS2-2 J803-6 ET-22	28	ET-29	JR1-4 J87-3 J88-4	36	ET-37 (GND) (駆動) (Paper Pick-up Unit)	J9-7 J9-9 J16-2 J17-2 J18-2 J19-2 J20-2 J21-2 J22-2	44	ET-53 (24V) (レジストユニット) (Registration Unit)	J23-9 J37-2 J78-1 J79-1	51	ET-2A (GND) (転写ユニット) (Transfer Drum Unit)	J40-3 J41-3 J11A-2 J12A-2 J42-2 J43-2 J8A-3 ET-3A
5	ET-6 (5V)	J402-6 J62-1 J87-1	13	ET14 (5V)	J82-1 CNC-1 J154-2 J7A-1 J502-9 J401M-1 J88-4	21	ET-22 (GND)	J23-5 J204S-2 J201S-4 ET-23	29	ET-30	UNUSED	37	ET-38 (-12V)	J808-4 J110-7 J87-5	45	ET-53A (5V)	J87-1 J110-1 J803-1	52	ET-3A (GND) (転写ユニット) (Transfer Drum Unit)	J45-2 J8A-2 ET-2A J9A-3
6	ET 7 (GND)	J84-3 J84-6 J85-3 J85-6 J402-5 J87-2	14	ET15 (24V)	J82-4 J502-1 J502-3 J502-5 J401M-1 J88-5 ET16	22	ET-23 (GND)	J70-1 J70-4 J71-2 J601-3 J72-2	30	ET-31 (GND)	J87-2 J88-3 J803-5	38	ET-40 (5V) (レジストユニット) (Registration Unit)	J23-4 J24-1 J25-1 J26-1 J27-1	46	ET-54 (+12V)	J305-6 J359-3 J31-1	53	ET-4A (5V) (転写ユニット) (Transfer Drum Unit)	J28-4 J44-1 J13A-1
7	ET-8 (5V)	J84-1 J84-4 J85-1 J85-4 J87-3	15	ET16 (24V)	J1A-14 J37-2 ET-15	23	ET-24	J804-2 J110-3 J88-11	31	ET-32 (24V)	J101-68 J38-2 J29-1 SW8-C J708-1 J4-1 J8-5 J88-5	39	ET-42 (GND) (レジストユニット) (Registration Unit)	J23-5 J24-2 J25-2 J26-2 J27-2	47	ET-55 (GND)	J48-1 J509-2 J48-3	54	ET-5A (GND) (転写ユニット) (Transfer Drum Unit)	J28-3 J44-2 J13A-2



No.	ET No.	CONNECTOR	No.	ET No.	CONNECTOR
40	ET-48 (24V) (カウンタ用) (Counter Unit)	J65-4 CNT1 CNT2 CNT3 CNT4	48	ET56 AC (BK) 100/115V	J1-1 J902-2 SW1-LINE3 H3-1
41	ET-49 (24V) (ホッパ駆動) (Hopper Drive Unit)	J58-5 SL17-1 SL18-1 SL19-1 SL20-1		ET58 AC (BK) 220/240V	J1-1 J902-2 SW1-LINE3 H3-1 J306-4 JAP0-1
42	ET-50 (+12V)	JA50-1 J304-9 J87-8	49	ET57 AC (W)	J1-2 J306-2 J902-1 SW1-LINE1
43	ET-52 (24V)	J805-3 J97-1 J98-1 J99-1	50	ET-1A (5V) (転写ユニット) (Transfer Drum Unit)	J40-1 J41-1 J11A-1 J12A-1 J42-1 J43-1 J45-1 J8A-1 J9A-4
44	ET-53 (24V) (レジストユニット) (Registration Unit)	J23-9 J77-1 J78-1 J79-1	51	ET-2A (GND) (転写ユニット) (Transfer Drum Unit)	J40-3 J41-3 J11A-2 J12A-2 J42-2 J43-2 J8A-3 ET-3A
45	ET-53A (5V)	J87-1 J110-1 J803-1	52	ET-3A (GND) (転写ユニット) (Transfer Drum Unit)	J45-2 J8A-2 ET-2A J9A-3
46	ET-54 (+12V)	J305-6 J350-3 J31-1	53	ET-4A (5V) (転写ユニット) (Transfer Drum Unit)	JX8-4 J44-1 J13A-1
47	ET-55 (GND)	J48-1 J509-2 J48-3	54	ET-5A (GND) (転写ユニット) (Transfer Drum Unit)	JX8-3 J44-2 J13A-2



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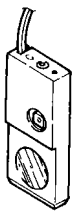
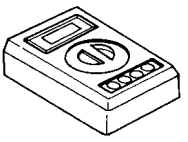
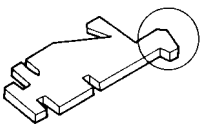
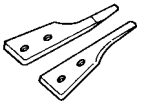
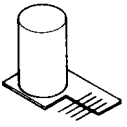
X. LIST OF SPECIAL TOOLS

The following special tools are required in addition to the standard tool set for servicing the machine.

No.	Description	Tool No.	Appearance	Rank	Use/Remarks
1	Laser power tester	TNK-0481		A	For adjusting the laser intensity of the laser unit. Use digital multimeter CK-0436 with the checker.
2	Digital multimeter	CK-0552		A	For electrical checks. The multimeter is used with the laser power checker to adjust the laser intensity of the laser unit.
3	Door switch actuator	TKN-0093	Use this tab. 	A	
4	Replacement blade for stop ring pliers	CK-0426		B	For removing grip rings. (4 to 9 mm)
5	Environment sensor calibration PCB	TKN-0456		B	For checking the environment sensor.

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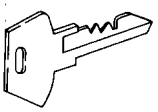
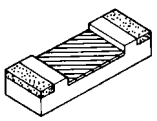
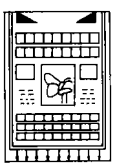
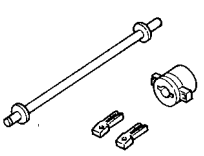
No.	Description	Tool No.	Appearance	Rank	Use/Remarks
6	Environment measuring PCB test tool	TKN-0457		B	For checking the environment measuring PCB.
7	Control key	CK-0423			Accessory
8	Electrode for checking the drum surface potential sensor	TKN-0197		B	For checking the zero level of the drum surface potential sensor.
9	CA1 test sheet	FY9-9030 -000		A	For adjusting/checking the image.
10	Lubricant	TKN-0480		A	For lubricating photosensitive drum and blade; if new.
11	Turret Positioning tool	FY9-3001		B	For replacing the turret.

Information: Rank
A: One tool for each serviceman.
B: One tool for every five servicemen.
C: One tool for each workshop.

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Y. SOLVENT AND MATERIAL LIST

No.	Material name	Use	Chemical formula, mixture ratio, etc.	Source	Remarks
1.	Ethyl alcohol (Ethanol) Isopropyl alcohol (Isopropanol)	Cleaning: copyboard, glass, mirror, etc.	C_2H_5OH $(CH_3)_2CHOH$	Locally	Take care in handling. All are flammable. Use in a well-ventilated area. Avoid breathing vapor.
2.	MEK	Removing toner or oil stains	CH_3-CO-C_2H_5 Methylethy ketone	Locally	Do not use for cleaning the drum, plastic molded parts, or corona wires. Use in a well-ventilated area and avoid breathing vapor. avoid contact with eyes or with skin.
3.	Heat-resistant grease	Lubricating the drive mechanisms, e.g. copyboard driving gear, fixing drive gear, fixing ass'y, etc.		CANON	Tool No.: CK-0427 (500 g can) (Equivalent grease can be used, but should be able to withstand 200°C for extended periods of time.)
4.	Lubricating oil	Lubrication points	ISO VG 68 oil ESSO Feibs K68 MOBIL Vactra oil No. 2 SHELL Tonna oil T68	Locally	Equivalent oil can be used. Tool No. CK-0451 (100 cc)
5.	Flanned cotton cloth	Cleaning and other parts		Local	It should be soft enough for cleaning the drum, and it should not produce lint.
6.	Lint-free paper	Cleaning	Kimberly-Clark Kim wipes 6020-23 × 40 cm, or 6021-13 × 21 cm	Locally	It should be soft enough for cleaning the drum, and it should not produce lint.

Note:
Solvent listed are not toxic, but they may produce minor, temporary effects if breathed in high concentration, or if they contact the skin for period of time. Any effects are temporary, but exercise reasonable caution nevertheless.

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COLOR LASER COPIER 500 FILM PROJECTOR (old type)

SERVICE MANUAL

I. SPECIFICATIONS

1. Projector	
1) Type	Fixed
2) System	Projection
2. Projection lens	f/2.8
3. Lamp (tungsten-halogen)	36 V, 400 W
4. Projection size	A5 (on copyboard glass surface)
5. Film types	Negative and positive
6. Film size	
1) Standard screen	24 × 36 mm/0.94 × 1.42 in.
2) Copy area	23 × 34 mm/0.9 × 1.3 in. (standard)
7. Copy area displacement	
1) Top and bottom	0 to 1.8 mm/0 to 0.07 in.
2) Right and left	0 to 1.8 mm/0 to 0.07 in.

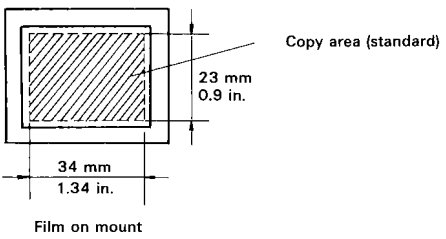

Figure 1-1

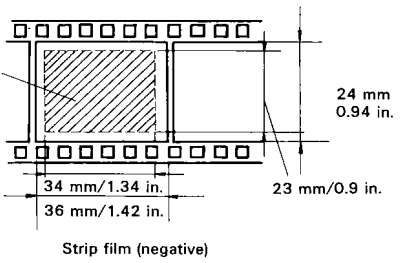

Figure 1-2

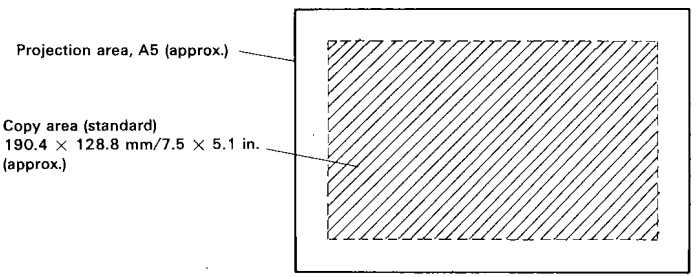

Figure 1-3 Image projected on copyboard glass

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8. Projection reproduction ratio	× 5.6
9. Dimensions	
1) Projector	371(H) × 340(W) × 450(D) mm 14.6(H) × 13.4(W) × 17.7(D) in.
2) Mirror unit (closed)	35(H) × 332(W) × 223(D) mm 1.4(H) × 13.0(W) × 8.8(D) in.
10. Weight	
Projector	8 kg/3.6 lb. (including power supply)
Mirror unit	2.3 kg/1.1 lb.
11. Power	115V 60Hz 220V 50Hz 240V 50Hz
12. Power consumption	0.55kW (max.)

Information in this manual is subject to change with improvement or redesign of the projector.

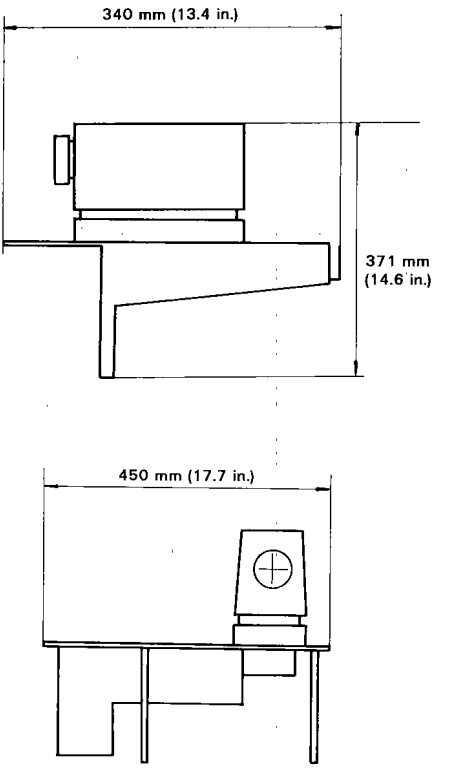

Figure 1-4

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B. Film

1. Thickness of Mount

- Projection: 1.0 to 2.5 mm

2. Material of Mount

- Projection: paper, plastic

3. Density Allowance (projection only)

- Positive film: optimum exposure* ±1 max.
- Negative film: optimum exposure* ±1, −2 max. (ISO 400 max.)

* As determined by an exposure meter (not one built into the camera) and processed as specified by the manufacturer.

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C. Carrier Slide Changer

- Carrier ..... Accepts up to 6 frames of strip film.
- Slide changer ..... Accepts up to 12 mounts (w/2.5 mm-thick mount in use; or 30 mm in total thickness)

Standards (ISO) of Mounts Available Commercially (frame for positive film)

The standards established for mounts that are available commercially are as shown in Figure 1-6. As can be seen, the standards are limited to four dimensions of the mounts, and the discrepancy for the window in top/bottom and left/right directions is left out.

The discrepancy, or variation from mount to mount, can affect the image even when they are set correctly on the slide changer.

Since variation in mounts from a single source (manufacturer) tends to be minimal, it is recommended that the mount used most frequently be used in adjusting the image area. For adjustment of the image area, see p. 3-10F.

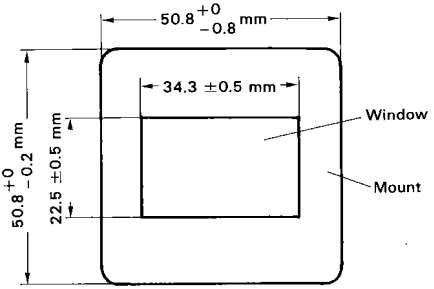

Figure 1-5 Standards established for mounts available commercially

No established standards, further, are available for the thickness of mounts; the thickness of mounts that can be used with the projector without difficulty of insertion and removal is 1.0 mm to 2.5 mm (see p. 1-1). The use of thicker mounts may result in trapping, displacement, or damage.

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II. NAMES OF PARTS

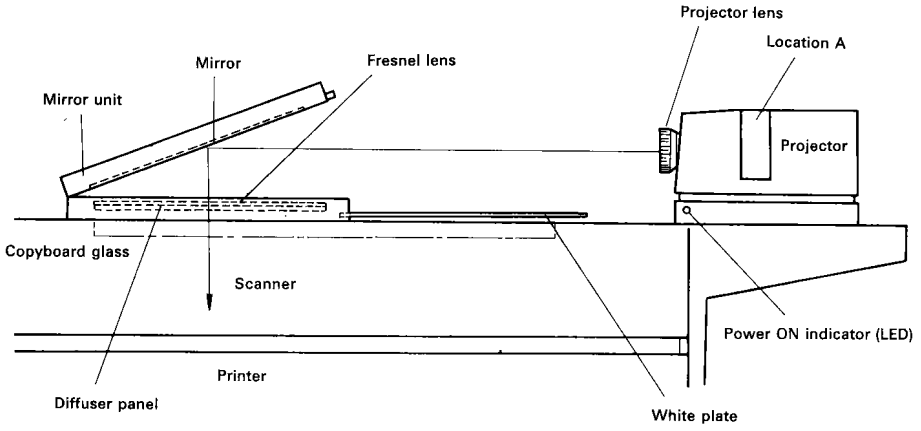
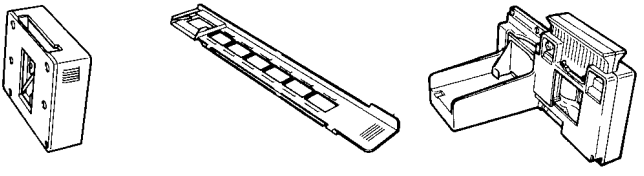


Figure 1-6

Parts for use in location A of projector



Slide magazine | Slide carrier | Slide changer

Figure 1-7

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III. ROUTINE INSPECTIONS BY THE USER

A. Cleaning

It should be carefully explained to the customer that the following parts should be cleaned whenever necessary.

1. Projection lens

Remove loose dust using a blower brush. For fingerprints and other marks that can not be brushed off, use lens cleaning tissue, other soft lint-free paper, or soft cloth slightly moistened with alcohol or lens cleaning fluid. (Never put liquid directly on the lens, for it can seep inside and cause problems.)

2. Mirror

Clean the mirror with a blower brush. If this is not sufficient (fingerprints, etc.) wipe it gently with lint-free paper moistened with alcohol. Be careful not to scratch the mirror.

3. Fresnel lens (both sides)

Clean with a blower brush. If dirt still does not come off, wipe lightly with lint-free paper or a cloth moistened with alcohol. Do not rub the sides of the lens strongly as that can damage the fresnel lens surface and result in appearance of scratches on the copies made.

4. Acrylic plate

Clean it with a blower brush.

5. Cyan filter (magazine), ND filter (slide changer)

Clean them with a blower brush.

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I. PRINCIPLES OF OPERATION

The light beam from the projector (having passed through the film) is reflected by the mirror of the mirror unit (on the copyboard glass) and passes through the fresnel lens (also of the mirror unit) which focuses the image on the ground (frosted) surface on the other surface of the lens. The image then is in the same plane as a sheet of paper on the copyboard, and the copying machine can copy it in the same way as it would a paper document.

II. COMMUNICATION WITH THE SCANNER

Signals are transmitted between the image scanner unit and projector on three lines. Figure 2-1 and Table 2-2 give the signal names and meanings.

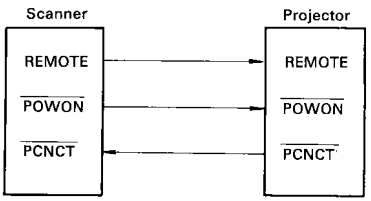

Figure 2-1

Signal name		Meaning/function
Image scanner unit ↓ Projector	REMOTE	The output is an analog voltage signal indicating the projector lamp operating voltage for optimum lamp intensity (determined by scanner preliminary scan). The signal also controls operation of the projector fan.
	$\overline{\text{POWON}}$	The output is "0" when the image scanner unit is in projector mode.
Projector ↓ Image scanner unit	$\overline{\text{PCNCT}}$	The output is "0" when the image scanner unit and projector are connected.

Figure 2-2

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III. DESCRIPTION OF ELECTRICAL CIRCUITS

A. Outline

The electrical mechanisms of the projector are controlled by signals sent from the image scanner unit.

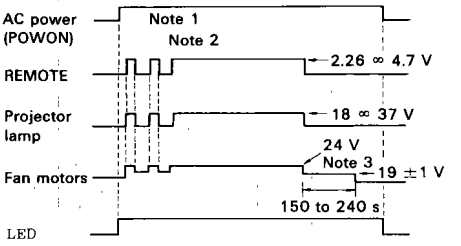
When the projector mode is selected on the image scanner unit, the unit causes $\overline{\text{POWON}}$ to go '0' and, as a result, the relay (RL1) goes ON. In this condition, the projector is supplied with AC power, which in turn causes the POWER LED go ON.

$\overline{\text{POWON}}$ will not go '1' unless the image scanner unit is turned OFF. When the unit is turned OFF, $\overline{\text{POWON}}$ goes '1' and, as a result, the relay (RL1) goes OFF, which in turn causes the POWER LED to go OFF.

The cover switch (SW1) goes OFF when the cover is opened for replacement of the halogen lamp; at the time, the halogen lamp (LA1) is forced OFF regardless of the state of the REMOTE signal.

Figure 2-3 shows the output voltage sequence in relation to the REMOTE signal of the image scanner unit. The scanner makes an initial scan and the control voltage suited to the optimum intensity is sent by the image scanner unit to the projector as the REMOTE signal, which is used to turn the halogen lamp ON or OFF and to control its intensity.

The REMOTE signal, further, also controls the fan motors (FM1, FM2), and its generation causes the fan motors to start rotation. When the REMOTE signal goes OFF, the fan motors rotate at a constant voltage (19 V) for about three minutes to cool the halogen lamp.



Notes
1. REMOTE signal (analog) during shading compensation.
2. REMOTE signal (analog) during automatic density adjustment.
3. Fan motor voltage after REMOTE signal goes OFF (19 V)

Figure 2-3

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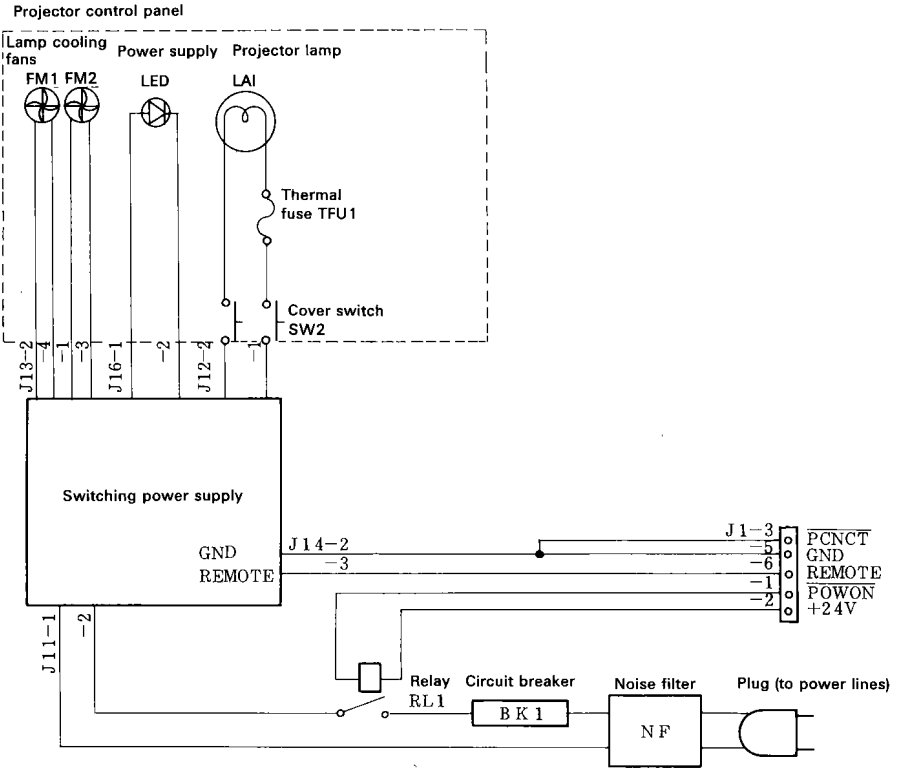

Figure 2-4

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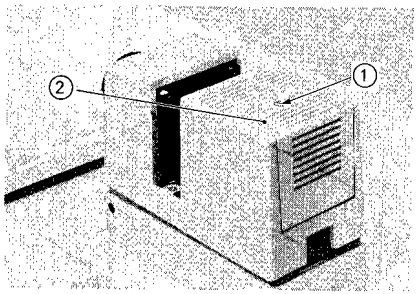
I. OPTICAL SYSTEM

A. Replacing the Projection Lamp

Note:
Be sure to use lamps of a specified type.

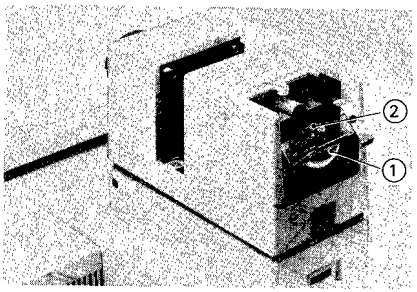
1) Switch the image scanner unit OFF and unplug its power cord.
2) Remove the screw of the lamp cover.



① Screw ② Lamp cover

Figure 3-1

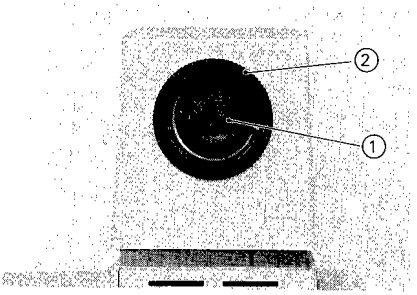
3) Open the lamp door.
4) Wait until the lamp is cool, then open the reflector.



① Reflector ② Lamp

Figure 3-2

5) Pull out the old lamp.
6) Pull the pins of the new lamp out of the plastic bag. Keep the lamp in the bag while handling it in order to avoid getting fingerprints on the lamp. (Fingerprints or other oils will damage the lamp when it heats up.)
7) Insert the pins of the new lamp in the socket.
8) Make sure the lamp is inserted fully, and check that it is not leaning to one side.
9) Close the reflector and door.
10) Look through the projection at the filament. If the filament is not centered in the lens, open the door and reflector and move the lamp as required, then check again. (Hold the lamp with clean paper, cloth, or plastic, not bare fingers.)



① Projection lamp filament ② Projection lens

Figure 3-3

Note:
Look straight into the lens, as shown in Figure 3-4. This may require some practice.

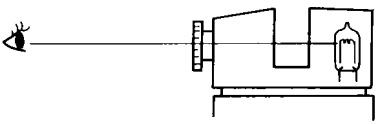


Figure 3-4 Line of sight to filament is horizontal

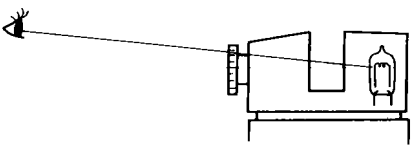


Figure 3-5 Line of sight to filament is not horizontal

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II. ASSEMBLY PROCEDURE

1) Remove the two screws and remove the right copyboard glass retaining plate.
2) Remove the five screws and remove the scanner right cover.

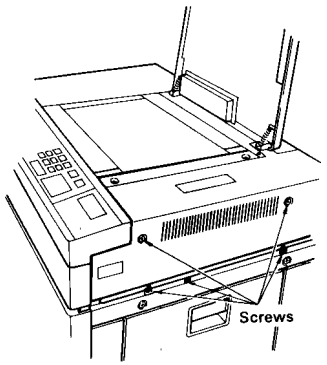

Figure 3-6

3) Remove the cover from the top of the scanner unit right cover.

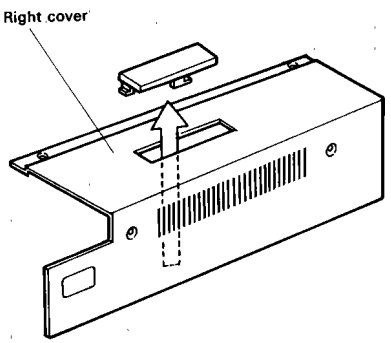

Figure 3-7

4) Attach the projector unit positioning plate to the scanner unit right cross-member with two screws (white, M4 × 6).

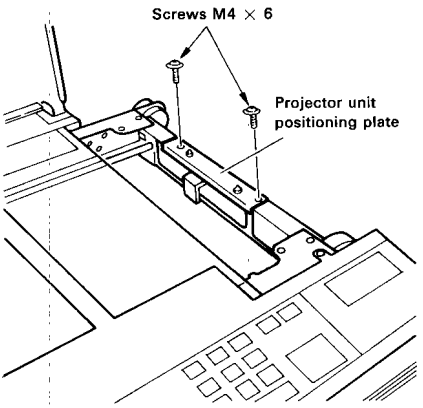

Figure 3-8

5) Reattach the scanner unit right cover using the two screws (A) removed in step 2).
6) Reattach the right copyboard glass retaining plate using the screw (B) removed in step 1).

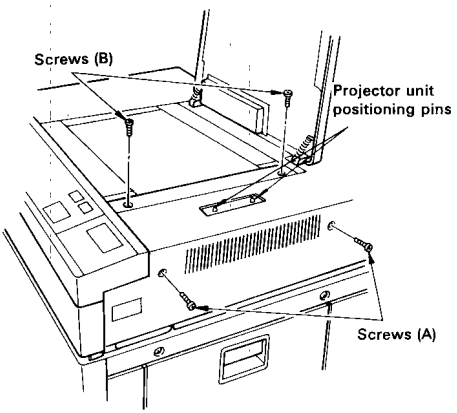

Figure 3-9

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7) Set the projector unit on the copying machine with the alignment holes of the mounting plate over the positioning pins of the plate; see Figure 3-9). Secure it with two M4 × 8 screws of the kit.

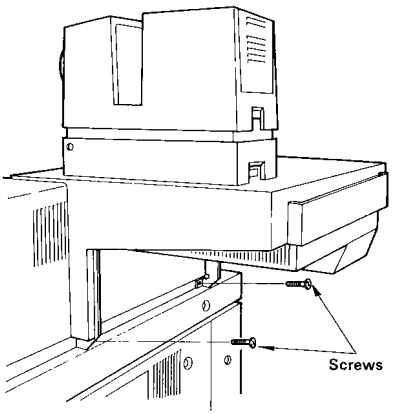

Figure 3-10

8) Fully secure the right cover with one of the three remaining screws.
9) Remove the two screws securing the blanking plate to the rear panel and remove the plate.

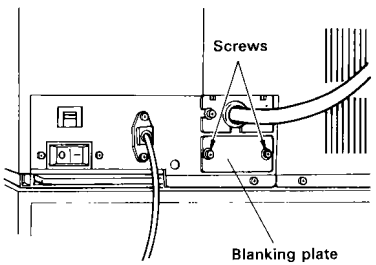

Figure 3-11

10) Connect the connectors of the cables from the scanner unit and the projector.

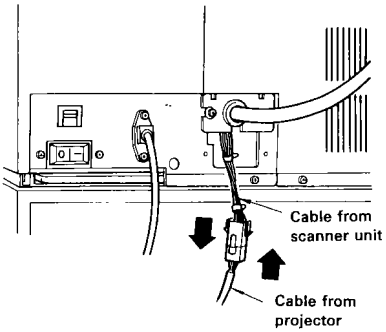

Figure 3-12

11) Connect the cable mounting plate to the scanner unit using the two screws taken out in step 9).

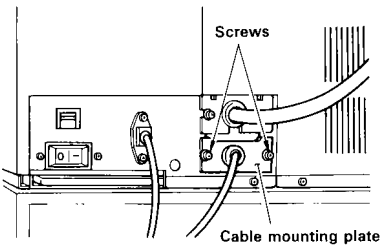

Figure 3-13

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12) Connect the projector power cord socket for power cord to the projector

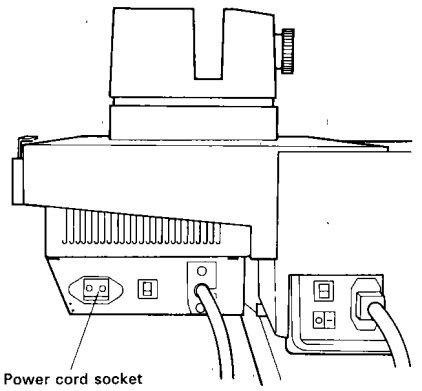
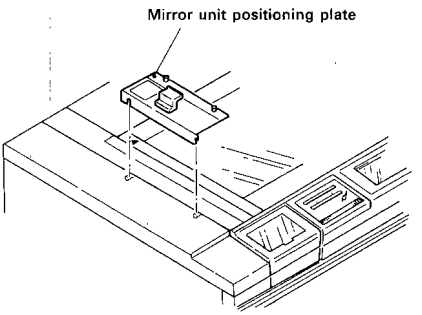


Figure 3-14

13) Mount the positioning plate for the mirror unit on the left cover.



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III. POSITIONING THE PROJECTOR

A. Outline

The projector must be positioned so that the projected light strikes the correct position on the copyboard at 90°, and the beam travels parallel to the direction of movement of the scanner unit.

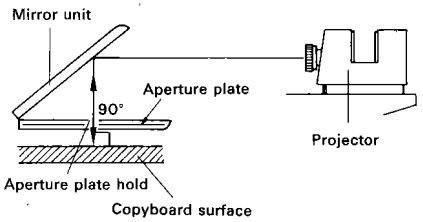

Figure 3-15

Correct: Incident angle is 90°, and the beam strikes the aperture of the plate.

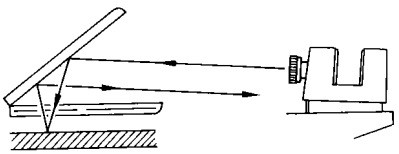

Figure 3-16

Incorrect: Incident angle is not 90°, and the beam does not strike the aperture of the plate.

Use the following procedure to position the projector.

B. Procedure

1) Open the mirror unit, remove the two screws and remove the two stop plates to allow the aperture plate to move.

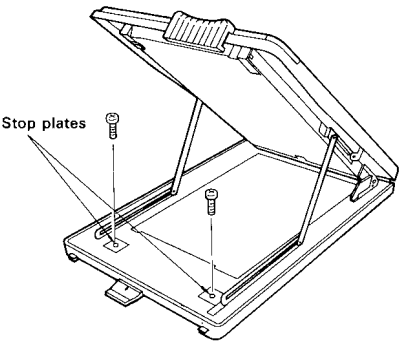

Figure 3-17

2) Slide and pull out the aperture plate into the direction of the arrow (Figure 3-18), and remove the two mounting screws from the fresnel lens retaining plate.

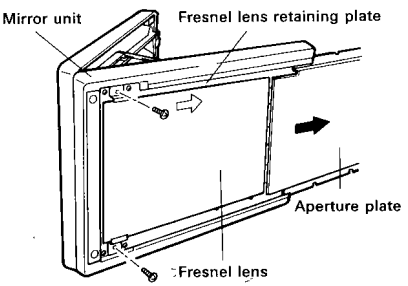

Figure 3-18

3) Pull out the fresnel lens mounting plate into the direction of the arrow (Figure 3-18), and remove the fresnel lens.

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Notes:
1. Do not scratch or touch the surface of the lens. (The outer 7 mm border is outside the optical path and may be touched without damage.
2. It is useful to make a small dot with a marking pen in one corner of the bottom face so as to enable identification of the surfaces when reinstalling the lens.

4) Slide the aperture plate back fully into the frame, then position the mirror unit on the copyboard glass by fitting the holes in the frame over the pins on the mirror unit positioning plate.

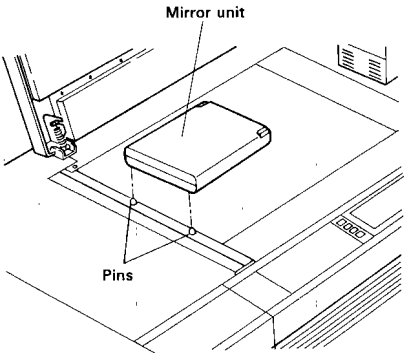

Figure 3-19

5) Remove the slide magazine from the projector.
6) Remove the screw with a flat-blade screwdriver or coin and remove the cover for replacing the lamp (Figure 3-20).

7) Remove four screws shown in the illustration below and remove the top cover.

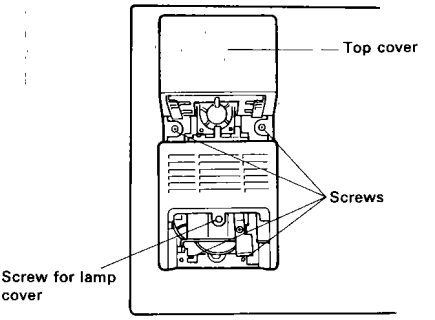

Figure 3-20 (View from the top)

8) Loosen the two screws shown in the illustration below and two other screws (not shown) at the corresponding locations on the other side.

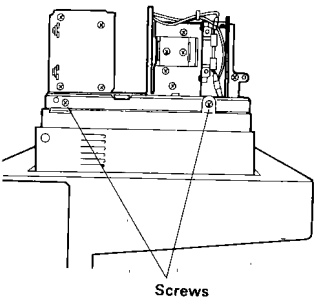

Figure 3-21

9) Remove the two screws underneath the projector mount and remove the lower cover.

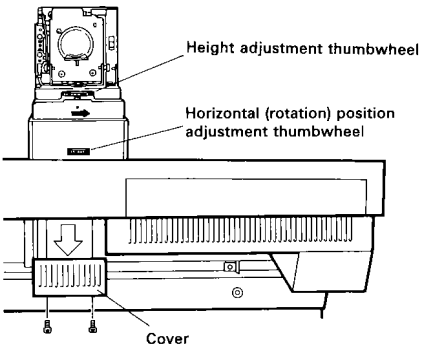

Figure 3-22

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10) Loosen the four screws underneath the projector, shown in Figure 3-23.

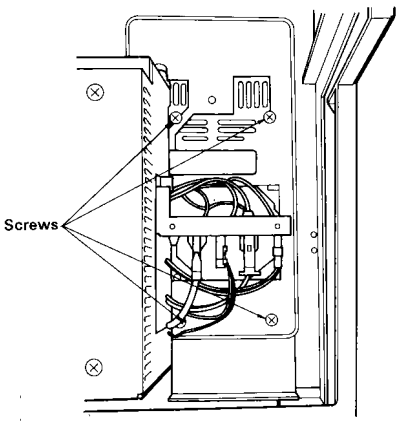

Figure 3-23

11) Insert the door switch actuator into the place shown by the arrow in Figure 3-24 to turn ON the cover switch.

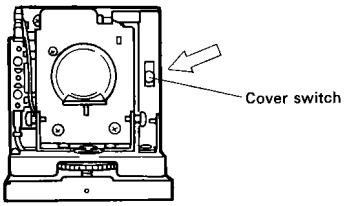

Figure 3-24

12) Connect the power plugs of the printer unit, image scanner unit, and projector.
13) Turn the power switches of the image scanner unit and printer unit.
14) Open the mirror unit.
15) Pull out the aperture plate from the mirror unit.
16) Perform the following in preparation for projection.

Preparation for projection

1) Press the PROJECTOR key.
   - The projector mode is activated.
2) Press the POS and OK keys.
   - The next screen is brought up.
3) Press the SHADING key.
   - The next screen is brought up.

A. Adjustment step using the pinhole disc

Note:
The following adjustment requires seeing a dim spot of reflected light. Make the room as dark as possible.

17) When the shading process is over, remove the lens of the projector by turning it counterclockwise.
18) Install the collimator in the lens opening, then reinstall the lens and turn it clockwise until it stops.

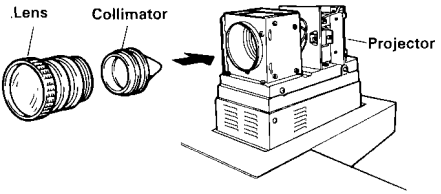

Figure 3-25

19) Remove the lens cap. Remove the backing sheet from the pinhole disc and stick the disc securely to the lens housing with the pinhole centered over the lens. It does not matter if the pinhole could not be exactly centered. Off-center of about 1 mm would not affect the ensuing adjustment procedure using the pinhole disc.

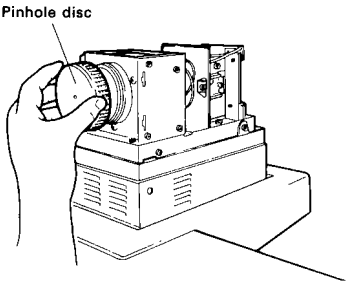

Figure 3-26

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20) Pull out the aperture plate and put the alignment mirror on the copyboard glass (reflective slide up) in the former location of the aperture of the plate.

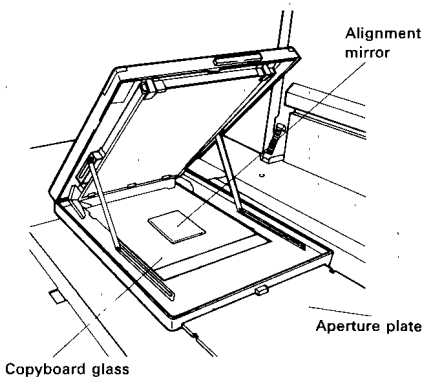
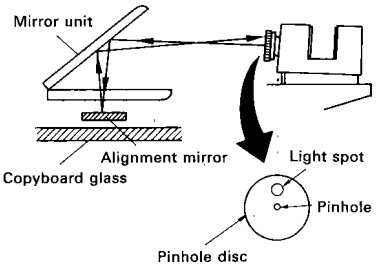


Figure 3-27

21) Press Focus (This turns ON the focussing light).

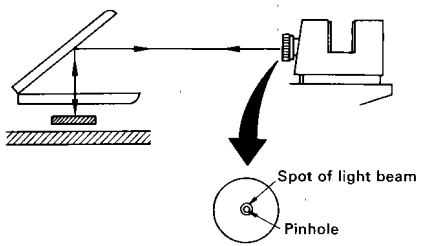
Note:
Unless steps 16) to 21) are carried out within two minutes, the copying machine will reset itself and the projector mode will be concelled. In such a case, display panel need to be operated again from the start of step 16). The repetition also entails removing the collimator (Figure 3-25), pinhole disc (Figure 3-26) and reinstalling the projector lens.

22) Align the spot of light beam with the pinhole of the pinhole disc. If the height adjustment thumbwheel (upper) is turned to the right, the projector will rise.



Incorrect: There is not alignment between the spot of light and pinhole of the pinhole disc.

Figure 3-28



Correct: There is alignment between the spot of light and pinhole of the pinhole disc.

Figure 3-29

23) Replace and tighten the four screws in Figure 3-20, and tighten the four screws underneath the projector in Figure 3-23.
24) Remove the mirror and slide the aperture plate back into position.

Note:
Make sure the aperture plate is positively pushed back into position as far as it will go.

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B. Adjustment step using the aperture plate hole

Note:
The light spot is permitted to be as much as 5 mm away from the target position on the aperture plate. Go through the procedure of positioning the mirror unit and the projector again if the light spot is more than 5 mm away. However, correct adjustment is usually simple to achieve.

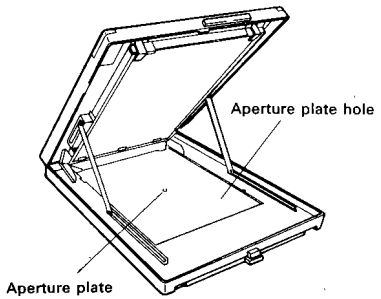

Figure 3-30

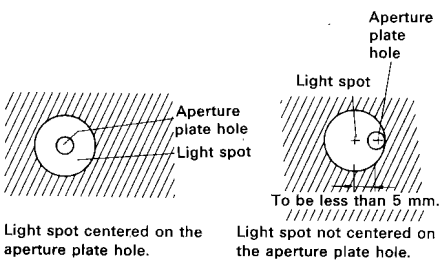
Aperture plate hole
Light spot
Aperture plate hole
Light spot
To be less than 5 mm.
Light spot centered on the aperture plate hole.
Light spot not centered on the aperture plate hole.

Figure 3-31

25) Press (FIX) on the display panel of the copying machine to stop projection.
26) Remove the collimator and reinstall the top cover (Figure 3-20) with four screws and reinstall the lens.
27) Remove the pinhole disc from the lens and replace its backing sheet. Store the disc, collimator, and alignment mirror for future use.
28) Remove the mirror unit and reinstall the fresnel lens, making sure the surface etched with concentric circles faces upward (away from the copyboard glass).

Notes:
a) The two faces of the fresnel lens are not identical. The face with the concentric-circle pattern is the top and should face the mirror. The "stop" around the edges of the lens identifies the back of the lens.
b) The screws holding the fresnel lens retaining plates have a bushing that prevents the plates from being squeezed by the screws. Be sure that the bushings are installed when re-installing the plates, and check that the retaining plates can move freely.
c) When copies are to be made using the copyboard without the projector, close the mirror unit and lift it off the pins.

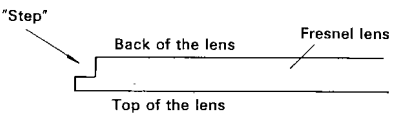

Figure 3-32

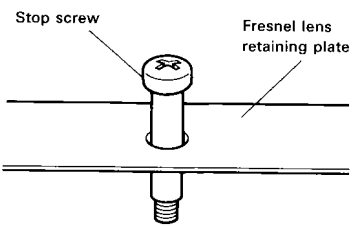

Figure 3-33

29) Push the aperture plate back into the mirror unit, then replace the two stop screws.
30) Install the mirror unit on the copyboard snapping the tabs into the slots.
31) Reattach the lower cover using the two screws shown in Figure 3-22.

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IV. IMAGE ADJUSTMENT

A. Introduction

Put the copier into service mode and adjust the image area if the "slide carrier" or "film mount" shadows appear.

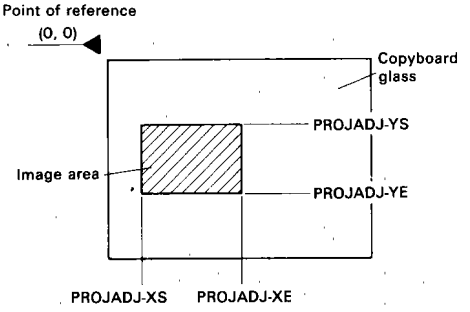

Figure 3-34

B. Procedure

1) Place the "slide magazine" and an empty "slide carrier" into the projector.
2) Press (PROJECTOR), (POS), and (SHADING). Focus the "slide carrier" frame, and then press (FIX) key.
3) Put the copying machine into copying mode as follows.
   Select
   - "DIRECT" copy
   - A4 or letter
   - AE function OFF
   - "SINGLE-COLOR" copy
4) Put the copying machine into service mode and select <3 PROJ ADJ> (OLD).
5) Press the (PRINT) key, and if the "slide carrier" frame shadows appear on the copy, follow the steps in "C. Image Area Adjustment."

Note:
The above adjustment is to be done with reference to the image on copies delivered on the copy tray.

6) Reinsert the "slide carrier" and go through step 5) several times.
7) Remove the slide magazine from the projector and insert the "slide changer" and "base film".
8) Press the (PRINT) key, and if the shadows from the slide mount appear on the copy, follow the steps in "C. Image Area Adjustment."

Note:
The above adjustment is to be done with reference to the image on copies delivered on the copy tray.

9) Reinsert the "base film" and go through step 8) several times.
10) After completion of adjustment, make a note of new values.

Note:
To revert to the factory set number for XS, XE, etc., press 5. STD SET using the display panel of the image scanner unit.

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11) Press the [U] key three times to exit the service mode.
12) Make a note of new values on the service mode label.

C. Image Area Adjustment

Adjust the boundaries of the image area on the copy as follows.

a) To move XS to the left on the copy to increase the image size (i.e., to set a smaller coordinate value), press the ⇩ key of "1 PROJADJ-XS" as long as necessary to set the required value.

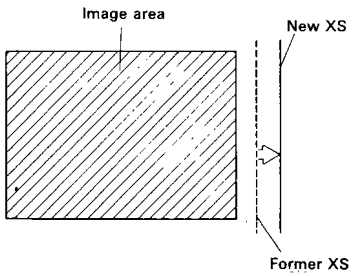

Figure 3-35

Note:
The opposite key can be used for any of these adjustments to correct an overshoot.

b) To move XS to the right on the copy to decrease the image size, press the ⇧ key of "1 PROJADJ-XS" as required.

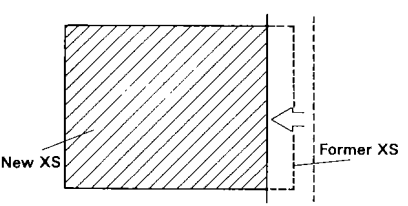

Figure 3-36

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c) To move XE to the left on the copy to decrease the image size (i.e., to set a smaller coordinate value), press the ⇩ key of "2 PROJADJ-XS" as required.

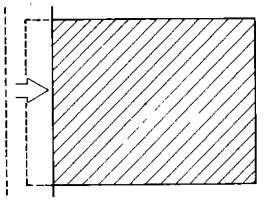

Figure 3-37

d) To move XE to the right on the copy to increase the image size, press the ⇧ key of "2 PROJADJ-XE" as required.

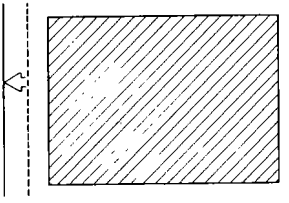

Figure 3-38

e) To move YS down on the copy to increase the image size (i.e., to set a smaller coordinate value), press the ⇧ key of "3 PROJADJ-YS" as required.

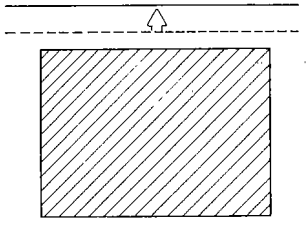

Figure 3-39

f) To move YS up on the copy to decrease the image size, press the ⇧ key of "3 PROJADS-YS" as required.

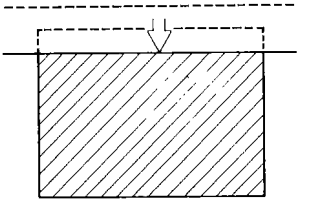

Figure 3-40

g) To move YE down on the copy to decrease the image size, press the ⇩ key of "4 PROJADJ-YE" as required.

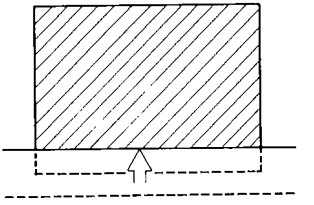

Figure 3-41

h) To move YE up on the copy to increase the image size, press the ⇧ key of "4 PROJADJ-YE" as required.

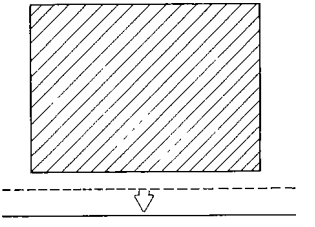

Figure 3-42

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I. PARTS TO BE REPLACED PERIODICALLY

There are no parts in the projector which have to be replaced periodically.

II. EXPECTED SERVICE LIVES OF CONSUMABLES

The parts listed below may require replacement during the warranty period, but are to be replaced only if they are faulty or worn. The expected service lives of these parts are as follows.

as of JAN. 1993

No.	Description	Part No.	Q'ty	Service life* (number of prints)	Remarks
1	Tungsten-halogen lamp (scanner lamp)	FH7-3203-000	1	20,000	
2	Base-density sample film (Fuji)	FF1-9046-000	1	10,000	
3	Base-density sample film (Kodak)	FF1-9047-000	1	10,000	
4	Base-density sample film (Konishiroku)	FF1-9048-000	1	10,000	

Note:
Numbers indicated in the table are estimates only, and are subject to change.

* Numbers indicated here are estimates for copies using the projector mode. The number of copies made so far in the projector mode can be verified by putting the copying machine into service mode and pressing 5 COUNTER .

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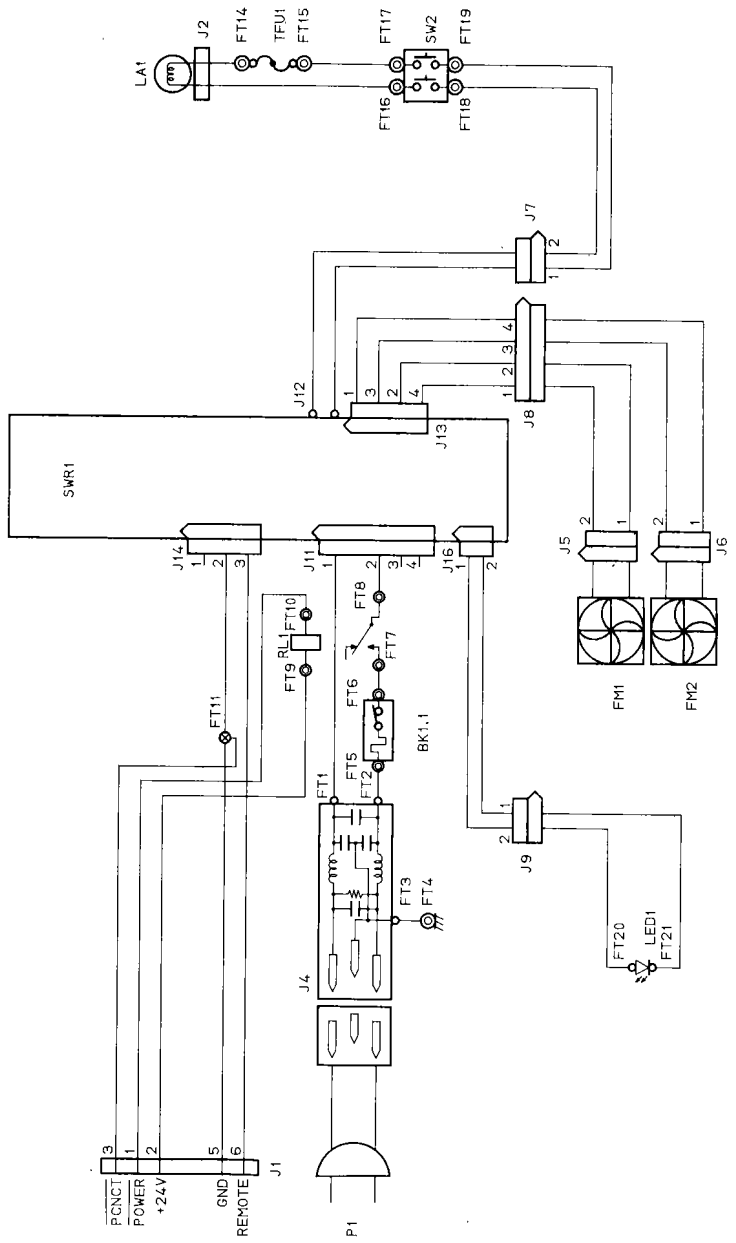
A. FILM PROJECTOR GENERAL CIRCUIT DIAGRAM



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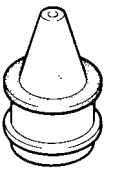
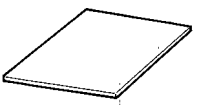
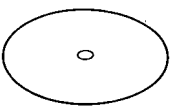
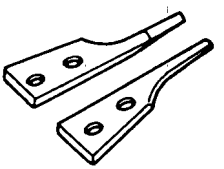
B. SPECIAL TOOLS

In addition to the set of standard tools, the following tools are necessary for servicing the projector.

No.	Tool name	Tool No.	Shape	Rank*	Application
1	Collimator	FF1-9055-000		A	For adjustment of optical path for projector
2	Optical path adjustment mirror	FA5-0439-000		A	For adjustment of optical path
3	Pinhole disc	FA5-0438-000		A	For adjustment of optical path
4	Extension blade for pliers	CK-0246		A	For removal of grip rings (4 to 9 mm)

* Rank.
A: Each serviceman is expected to carry one.
B: A group of five servicemen is expected to carry one.
C: Each workshop is expected to carry one.

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C. SOLVENTS AND OILS TABLE

No.	Name	Application	Contents	Remarks
1	Ethanol	Cleaning: • Fresnel lens • Reflector • Lenses	Alcohol	• Keep away from open flame. • Procure locally.
2	Solvent	Cleaning: • Metal parts (oil or toner dirt)	Alcohol • Hydrogen carbide (fluorine family) • Hydrogen carbide (chlorine family)	• Keep away from open flame. • Procure locally. • MEK may be substituted.
3	Heat-resistant grease	Drive parts	Lithium soap (mineral oil family) Molybdenum disulfide	• Hitazont MO-138S (Hitachi) • Tool No. CK-0427 (500 g/can)
4	Lubricant		Mineral oil (paraffin family)	• Uni-Way 68 (CK-0451) • S68 (Maruzen) or Mobil Oil No. 2 (Mobil) may be substituted.
5	Lubricant		Mineral oil (paraffin family)	• Uni-way 220 (Nihon Sekiyu) • Tool No. CK-0524 (100 cc) • S180 (Maruzen) may be substituted.

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